HSL No. 74-11
THIS ISSUE CONTAINS:
SEPTEMBER 30, 1974
HS-014 594 - 706 HS-600 673; 778; 912; 928; 977; 979; 984 HS-601 033; 084; 135-136; 187; 218; 244; 285; 291; 305; 343; 395; 409; 447; 459; 499; 551; 602; 632; 654; 705; 709; 762-764 HS-801 002; 080; 096; 103-104; 106; 112; 123-124; 133; 136; 138; 141-142; 144; 149; 151; 157-158; 169 HS-820 206

U.S. Department of Transportation
National Highway Traffic Safety Administration

Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

AVAILABILITY OF DOCUMENTS

Documents listed in **Highway Safety Literature** are not available from the National Highway Traffic Safety Administration unless so specified. They must be ordered from the sources indicated on the citations, usually at cost. Ordering information for the most common sources is given below.

NTIS: National Technical Information Service, Springfield, Va; 22151. Order by title and accession number: PB,AD, or HS.

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number.

Corporate author: Contact corporate author.

Reference copy only: Consult your librarian.

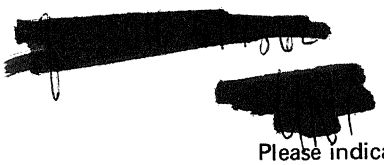
See serial citation: Obtain through normal loan or purchase.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by title and SAE report numbers.

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the mission of the National Highway Traffic Safety Administration. Submit material, together with a written statement of approval for publication to:

Office of Administrative Services (N48-50)
National Highway Traffic Safety Administration
400 7th Street, S.W.
Washington, D.C. 20590



Please indicate availability source and price for the material.

Special notice: Material published in HSL is intended only for information. References to brand names, equipment models or companies does not imply endorsement by the NHTSA or the U.S. Department of Transportation.

SEARCH SYSTEM AVAILABILITY

The HSL file is now available for computer searches on two types of systems. One is the batch-mode system which has been available and used for a few years; the other is RECON, a conversational-mode system developed for NASA and now used by several Federal agencies. The user must pay his own search costs on either system. Both systems are accessed via dialup telephone circuits.

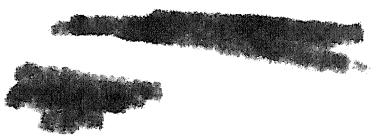
The batch-mode system is accessible from a 2780-type terminal. Your search formulation is on punched cards and the output comes back on a line printer, either at your terminal or at the computer.

The conversational-mode system is accessible from a teletype or ASCII terminal, including CRT terminals. Small outputs can come back on the terminal; larger outputs should be directed to the line printer at the computer.

Each system can search on author, corporate author, corporate author code, publication, report number, date and contract number. Subject searches in the batch-mode system are against subject indexing of terms from our thesaurus. Subject searches in the conversational-mode system are against any word or sequence which occurs in the title or abstract.

For further information write to:

Department of Transportation
National Highway Traffic Safety Administration
Technical Services Division (N48–41)
ATTN: HSL Production
400 7th Street S.W.
Washington, D.C. 20590



HS-014 594

EMISSIONS AND NOISE

Work of one company in the fields of exhaust emission control and vehicle noise abatement is reviewed. Consideration is given to the problem of atmospheric pollution, lines of research, post-treatment of exhaust gases, methods of measuring emissions, vehicle noise reduction procedures, and the use of an anechoic test cell for engine noise research.

by A. Baker
Publ: Journal of Automotive Engineering v3 n2 p24-6 (Feb 1972)
1972
Availability: See publication

HS-014 595

STANDARD TESTS FOR CAMS AND FOLLOWERS

The Coordinating European Council (CEC) for the Development of Performance Tests for Lubricants and Engine Fuels proposes a standardized cam and tappet test rig. The proposal is directed to motor manufacturers, oil companies, and additive suppliers in order to reduce the number of tests conducted. Details are given of the CEC cam and cam follower test machine, together with the results of a limited program of work on a prototype model of the rig to evaluate its potential for screening the anti-wear performance of lubricants. Several cam and tappet procedures were simulated: Ford Zephyr cam and tappet rig test, Peugeot tappet pitting test, and Volvo B18 cam and tappet wear test. The simulated tests were carried out with reference pass and fail oils and results were obtained that gave good correlation with the normal test procedures simulated, demonstrating the CEC test potential.

by D. C. Roberts; F. C. Wykes
Publ: Journal of Automotive Engineering v3 n3 p9-13 (Mar 1972)
1972 ; 1ref
Availability: See publication

HS-014 596

SUSPENSION GEOMETRY

An examination of suspension geometry provides a method by which the movements of the road wheel in contact with the road surface (scrub, steer, and fore and aft movements) are related to the pitch, bounce, and roll movements of the body of the vehicle. The object intended is to provide a working tool which is simple to use, which shows how changes in suspension layout affect the various parameters, and which will produce data that can be applied in ride and handling simulations. The method of calculation is shown to agree with the experimental results. The theoretical analysis is held to be justified and to enable the calculation of: displacement of and rotations about the tire contact patch; suspension derivatives; and the locus of any point within the suspension. Inputs to the system for which these values may be calculated are: body bounce, body pitch, body roll, and steering movement.

by D. M. Butler; J. R. Ellis
Publ: Journal of Automotive Engineering v3 n3 p14-21 (Mar 1972)
1972 ; 7refs
Availability: See publication

HS-014 597

ALTERNATIVE AUTOMOTIVE POWER PLANTS

The outlook for automotive power sources is reviewed, and it is concluded that the spark-ignition gasoline engine will remain the power source of the 1970's. Long-range alternatives include radically modified spark-ignition gasoline engines, diesel engines, gas turbines, battery and fuel cell, hybrid electric engines, Stirling engines, and Rankine cycle engines. The use of rotary, stratified-charge, and intake valve throttled engines is forecast. Problems with diesel engines are cited, and the competition of gas turbines is examined. Further consideration is given to the design and applications of electric and hybrid vehicles. The status of air pollution control efforts in the United States is also reviewed.

by E. M. Estes
Publ: Journal of Automotive Engineering v3 n4 p8-15 (Apr 1972)
1972
Availability: See publication

HS-014 598

SIMULATED ROAD TESTING

Two methods of simulated road testing are considered, the first based on records previously obtained in a prototype vehicle and the second on spectral description of the road surface. The first method is subject to three major drawbacks: before any test can be made, a prototype vehicle must be constructed and a stress history of the components under test recorded; the application of requisite forces and constraints to an isolated component can impose practical difficulties; and modification of any part of a component under test requires obtaining a new stress history before a modified test can be established. The second method is more promising and is being developed for industrial testing of vehicles. It seems likely to provide a very good simulation of vehicle response to random road profile undulation as it can be treated as an ergodic process. Equations for both methods are set forth.

Publ: Journal of Automotive Engineering v3 n4 p17-9 (Apr 1972)
1972 ; 4refs
Prepared in cooperation with the National Engineering Lab., under contract with the Dept. of Trade and Industry, Scotland.
Availability: See publication

HS-014 599

TRACTION V. STABILITY IN PASSENGER CARS

Experiments are described which studied the reasons why some cars have a feeling of insecurity on corners or are difficult to keep straight on high-speed roads. Consideration is given to oversteer or pseudo-oversteer, the effect of speed, stability with traction, and available solutions. It is found that the predominant unwanted effect of high speeds is the aerodynamic-positive (oversteer) couple which varies in a particular manner. If a car has several oversteer effects balanced in steady-state by a set of understeer effects, the sum of

which exceeds the oversteer, instability results. Equations are given.

by S. H. Grylls
Publ: Journal of Automotive Engineering v3 n5 p8-15 (May 1972)
1972 ; 2refs
Availability: See publication

HS-014 600

TRANSMISSION SYSTEM ANALYSIS FOR VARIED TASKS

Procedures used in the design and application of a combined torque converter-powershift transmission system are described. In conjunction with digital computers, these procedures provide data on specific power train proposals which are then compared with known values of acceptable and unacceptable data for clutch design, vehicle acceleration, deceleration, jerk, and vehicle response.

by T. W. Baehler
Twin Disc, Inc., Racine, Wis.
Rept. No. SAE-730838 ; 1973 ; 9p 3refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, 10-13 Sep 1973.
Availability: SAE

HS-014 601

POWER FLOW AND TORQUE IN EPICYCLIC GEARING

An alternative approach to the analysis and design of epicyclic gearing arrangements is described which begins with torque and power. The the speed relationships are revealed as a consequence. The derivation of the speed equation is shown along with the derivation of torque ratio, and the applications of the principles in synthesis. Complex trains are analyzed, and the generalization of torque analysis and its application are discussed.

by D. Fitzgeorge
Publ: Journal of Automotive Engineering v3 n6 p35-9 (Jun 1972)
1972 ; 4refs
Amended version of "Analysis of Epicyclic Gear Speed Ratios via Power Flow and Torque" by D. Fitzgeorge, Tech. Note MM4, Dept. of Mechanical Engineering and Engineering Production, UWIST, Cardiff, May 1969.
Availability: See publication

HS-014 602

LEGISLATION AND THE DIESEL ENGINE

Worldwide legislation dealing with noise and exhaust emissions of diesel engines is examined. Action taken in North America, Western Europe, Japan, and the United Kingdom are reviewed in terms of costs, rank of pollution sources, international coordination, engine treatments, predicted diesel engine noises, exhaust smoke, and exhaust gas emissions. The need for harmonization of legislation on a global basis is noted. It is suggested that some of the standards set are overrestrictive and do not result in the expected improvement in quality of life. The future of the diesel engine is assessed.

by D. Bampton
Publ: Journal of Automotive Engineering v3 n8 p20-5 (Sep 1972)
1972 ; 3refs
Availability: See publication

HS-014 603

SIMULATION OF VEHICLE DYNAMIC BRAKING CHARACTERISTICS

A mathematical model is presented for simulating vehicle dynamic braking characteristics. It has proved useful in demonstrating in some detail the fundamental characteristics of a braking system under specific conditions and in showing the influence of various parameters on braking behavior. It is anticipated that the incorporation of suggested improvements will ensure accurate respresentation over a wide range of operating conditions and provide the designer with comprehensive information for improved system optimization at the prototype stage.

by B. R. Aurora
Publ: Journal of Automotive Engineering v3 n8 p13-9 (Sep 1972)
1972 ; 14refs
Availability: See publication

HS-014 604

A SHORT CUT TO EPICYLIC GEARING DESIGN--PT. 1

The use of a certain chart to help design single- or multi-ratio gearboxes is shown in regard to applications to the solution of typical problems with multi-ratio trains. The chart covers the type of gear having only one carrier but possibly a complex arrangement of planetary members. Alternative gear ratios are achieved only by the selective braking of two central members; the input and output members of the train are always the same two central members. The method outlined allows the effects of alterations to be studied readily. Applications of the chart to specific problems are illustrated. The formula upon which the method is based relates transmission ratio, radius of the fixed (reaction) member, and radius of the output member.

by D. Fitzgeorge
Publ: Journal of Automotive Engineering v3 n9 p17-20 (Oct 1972)
1972
Availability: See publication

HS-014 605

A SHORT CUT TO EPICYLIC GEARING DESIGN--PT. 2

A continuance of a discussion of applications of the rF (radius of the fixed or reaction member) chart to the design of planetary gearboxes is presented. Examples of epicyclic gearing design are detailed, and the allocation of teeth numbers in the chart and equation is explained. It is suggested that the method offers to specialists a systematic way for obtaining a variety of gear forms from which the most promising ones can

be selected for detailed consideration. The problems of tooth alignment and gear assembly increase rapidly with increase of selectable ratios.

by D. Fitzgeorge
Publ: Journal of Automotive Engineering v3 n10 p16-21 (Nov 1972)
1972 ; 5refs
Availability: See publication

HS-014 606

THE FUTURE OF SEAT BELTS

Recent and probable future developments in seat belts are reviewed. Seat belt legislation in the United Kingdom and United States is discussed along with configurations and injury criteria requirements. Testing is reported which studied details of belt system, head severity index, peak head deceleration, maximum chest deceleration, peak shoulder belt load, and forward head movement. Research into passive seat belt systems and their injury criteria is examined, along with testing techniques and characteristics of the ideal passive belt material. Final consideration is given to a comparison of seat belt and air bags.

by E. Nichol
Publ: Journal of Automotive Engineering v3 n10 p9-15 (Nov 1972)
1972
Availability: See publication

HS-014 607

WRONG-WAY DRIVING ON CALIFORNIA FREEWAYS

Vehicle entrance onto the wrong end of freeway off-ramps was studied in an accelerated California program which uses a portable surveillance unit to count each vehicle wrongly entering an off-ramp and to verify the action by taking a single photograph. Program history and recent developments are reviewed, including types of signs used to indicate wrong direction to the driver. Problem ramps are identified as those of basically standard geometry, usually with no known previous problems, and those with difficult or confusing geometry. Wrong-way accident characteristics are described. The program is evaluated in terms of accident reduction and of improvements in confusion and inconvenience.

by J. D. Gabriel
Publ: Traffic Quarterly v28 n2 p227-40 (Apr 1974)
1974 ; 1ref
Availability: See publication

HS-014 608

HIGH MOBILITY VEHICLE DESIGN. AN INTRODUCTION: PT. 2 OF 3

An analysis of the soil and driving medium interface is undertaken to establish a mathematical solution to vehicle design, and the results are used to establish a mobility level that can be compared with a known condition. Equations are given with several variables examined: traction, resistance, wheels or tracks on soil; and stability, propulsion, and resistance in water. Problems of entry into and egress from water obstacles are discussed for high mobility amphibious vehicles.

by K. Parmee; C. D. Cernes
Publ: Journal of Automotive Engineering v3 n7 p10-3 (Jul 1972)
1972
Availability: See publication

HS-014 609

HIGH MOBILITY VEHICLE DESIGN. AN INTRODUCTION: PT. 1 OF 3

Some unusual aspects to be considered in dealing with high mobility vehicles are illustrated. Land obstacle performance (generally, the ability to negotiate vertical steps and lateral ditches) is determined for 4 x 2 vehicles, 4 x 4 vehicles, 4 x 4 vehicles with trailers, 6 x 4 vehicles, 6 x 6 vehicles, and tracked vehicles. Road performance, transmission wind-up, and tracked vehicle steering are also considered. Diagrams and equations are included.

by K. Parmee; C. D. Cernes
Publ: Jouranl of Automotive Engineering v3 n5 p16-20 (May 1972)
1972
Availability: See publication

HS-014 610

CAN 10 HOURS CAUSE ACCIDENTS?

A landmark study prepared for the Bureau of Motor Carrier Safety on driver fatigue and hours of services is examined to determine whether the existing rules need changing. The study contends that the system of paying truck drivers is structured to conflict with highway safety and should be changed. It is found that: there are real increases in driver errors during the latter part of a 10-hour shift; rest breaks become less effective as the shift progresses; sleeper drivers seem to be aided less by the rest breaks than relay drivers; several days of duty without extended time off has a cumulative effect in reducing the driver's awareness; older drivers (over 45) are more adversely affected by prolonged driving; awareness varies by time of day; more drivers approve of the present hours than disapprove. Recommendations for industry and government are offered, along with limitations of the study.

by S. Byczynski
Publ: Fleet Owner v69 n4 p76-9 (Apr 1974)
1974
Availability: See publication

HS-014 611

CRASH/INJURY-EJECTION STUDY. COMMERCIAL VEHICLE ACCIDENTS 1970-1971

A statistical study based on data from 782 accident reports and the follow-up questionnaires is presented on crash/injury and ejection in commercial vehicle accidents. Data for 1970 and 1971 are tabulated separately in six tables dealing with: driver ejection from power unit; ejection from sleeper berth to cab; driver contact with interior objects in relation to type of power

unit involved; area of ejection; installation and use of seat belts; and year of vehicle manufacture.

Bureau of Motor Carrier Safety, Washington, D.C.
1973 ; 22p
Availability: Corporate author

HS-014 612

A SIMPLIFIED PROCEDURE FOR COMPUTING VEHICLE OFFTRACKING ON CURVES. FINAL REPORT

A simplified procedure for computing vehicle offtracking on curves is presented, developed by modifying the existing procedures to identify critical bus offtracking. Modification consisted of the use of an additional geometric relationship required to calculate swept width, a parameter considered to be more significant than offtracking per se. Swept width is the apparent width of a vehicle as it executes a turning maneuver. Results of data analysis for 15 buses and three tractor-semitrailer combinations (widths of 96 and 102 inches), and a full-sized station wagon reveal that critical swept width does not occur until a curvature of 27 degrees, or a radius of 212 feet or less, is reached. The procedure can be used to select a maximum degree of curvature which would permit a vehicle to stay within the selected lane width and by regulatory agencies when permits are requested for movement of vehicles that exceed the legal maximum width or length.

by G. B. Pilkington, 2nd; P. D. Howell
Federal Hwy. Administration, Washington, D.C.
Rept. No. FHWA-RD-74-8 ; 1973 ; 28p 12refs
Staff Rept.
Availability: Corporate author

HS-014 613

ANOTHER CHANCE FOR ELECTRICS?

The status of electric vehicles is reviewed with an outlook for the future presented. Activities of competing manufacturers are described along with design problems that remain to be solved. Consideration is also given to past, present, and future batteries; candidates for battery systems; and the energy conservation factor with regard to velocity and acceleration. Proposed solutions for other aspects of the total electric car system, such as insulate panels and glass, efficient air conditioners, costs, and steering and cold weather, are also discussed.

by C. A. Gottesman; J. B. Pond
Publ: Automotive Industries v150 n8 p29-34 (15 Apr 1974)
1974
Availability: See publication

HS-014 614

AN EVALUATION OF THE EFFECTIVENESS OF THE RAC/ACU MOTOR CYCLE TRAINING SCHEME--AN INTERIM REPORT

The training of learner motorcyclists is examined, with data provided on useful material relating to the Royal Automobile Club/Auto-Cycle Union (RAC/ACU) training scheme. A new syllabus of training was worked out in which greater emphasis is placed on instruction in practical riding and road behavior and indicated ways in which an increased number of learner motor cyclists might be induced to undergo systematic training. A review of the literature is presented along with a study of the RAC/ACU training schemes. Results from questionnaires indicate that there is considerable diversity between the schemes, reflected in the experience and training which the organizers have received to carry out such work, the instructor pupil ratio, the length of time of each course, the emphasis placed on the various topics and the facilities avaiable for training.

by S. Raymond; S. Tatum
Salford Univ., Lancs. (England). Road Safety Res. Unit
1973 ; 201p 30refs
Availability: Corporate author

HS-014 615

THE MICHIGAN TRIAL SUBSTITUTE MOTOR VEHICLE INSPECTION PROGRAM

An experimental motor vehicle inspection program conducted by the Michigan State Police in three counties is described. The experiment was an enhancement of a checklane spot-inspection program. Follow-up procedures included mandatory repair of hazardous defects and a computerized monitoring system of the voluntary repair of non-hazardous defects. A random sample of 6000 vehicles was given full inspection, 43,000 were checked for lighting, and 5500 drivers were interviewed. For the six-month observation period, a 5-10% reduction in vehicle defects was obtained. Driver interviews showed no decrease in public acceptance of the program, despite substantially increased police effort. The follow-up procedures were effective, with 75% of the vehicles failing inspection being subsequently repaired.

by J. S. Creswell, Jr.
Publ: HIT Lab Reports v4 n5 p1-9 (Jan 1974)
1974 ; 11refs
Availability: See publication

HS-014 616

WRONG-WAY MOVEMENTS ON DIVIDED HIGHWAYS. FINAL REPORT

The purpose of this research was to study the problem of wrong-way movements on divided, rural highways in Indiana. The research was in two parts: a general review of the characteristics of wrong-way accidents that have occurred in Indiana, and an investigation of various alternatives that could be used to reduce wrong-way movements. The basic data were obtained by searching State Police accident records. Field investigations were made at accident sites to supplement the records and to determine the physical characteristics of access point where wrong-way movements originated. The studies showed 39 deaths resulting from 96 accidents over a three year period. Only 31% of the wrong-way drivers were not drunk, were not old (over 65) and/or were not fatigued. Conditions at typical wrong-way movement origin sites included darkness, low land-use and low traffic volumes. Any measure that improves the driver's visibility and perception of access points to divided highways would decrease wrong-way movements. Possible measures included night lighting, raising the elevation of crossroads, making medians more distinct, and the use of

simple configurations. Additional barrier curbs will direct traffic in the right direction.

by P. N. Scifres
Joint Highway Research Project, Lafayette, Ind.
Rept. No. JHRP-74-3 ; 1974 ; 127p 10refs
Master's thesis, Purdue Univ.
Availability: Corporate author

HS-014 617

ACCIDENTS: THEIR COST AND RELATION TO SURFACE CHARACTERISTICS

Several aspects of surface characteristics of highways in relation to accident risk are examined, and the potential for reduction in accidents by changes in texture are shown. The general accident situation is reviewed with some of the underlying causes discussed, together with an indication of costs associated with road accidents. Consideration is given to excess of injury accidents due to road wetness, skidding resistance, night visibility, and general visibility. All evidence points to the need for macroscopically rougher textures. Additional particular requirements are harshness, angularity of projections, and porosity of surface.

by B. Sabey
Transport and Road Res. Lab. (England)
1973 ; 12p 12refs
Presented at the Safety and the Concrete Road Surface--Design, Specification and Construction Symposium, Cement and Concrete Assoc., Birmingham, 29 Nov 1973.
Availability: Corporate author

HS-014 618

LINK SYSTEM OF THE HUMAN TORSO. FINAL REPORT

A quantitative description of the mobility of the human torso is developed in a systematic multidisciplinary investigation involving techniques of cadaver dissection, anthropometry, radiography and cinefluoroscopy, photogrammetric and computer analysis. Some 72 anthropometric dimensions were obtained on 28 male volunteers who were matched to a 1967 survey of 2385 males. Major results of the study are: prediction equations and graphs depicting both surface marker and bone reference point locations for a large range of body positions and specific anthropomorphic variables; prediction equations and graphs describing the motion of the base of the spine reference point in relation to defined seated and standing reference points for given reaches; and a statistical tabulation with illustrations of 72 anthropometric dimensions. Surface landmarks selected could predict precise locations of the underlying anatomical landmarks.

by R. G. Snyder; D. B. Chaffin; R. K. Schutz
Michigan Univ., Ann Arbor
Contract F-33615-70-C-1777
Rept. No. HSRI-71-112; AMRL-TR-71-88; AD-754 924 ; 1972 ; 330p 127refs
Rept. for Jun 1970-Jul 1971.
Availability: NTIS

HS-014 619

WHY I'M FOR BUCKLE-UP LAWS

Seat belt use laws are advocated and their encouragement by public officials is suggested. Benefits of seat belts are reviewed and the effectiveness of the Australian national safety belt law in reducing injuries is cited. American statistics are also mentioned regarding fatality prevention of belted drivers. The constitutional question of the possible intervention by the state in a private citizen's activity is examined, along with the relationship of air bags and the safety belt interlock system. Methods for promoting public discussion and support for the legislation are outlined.

by R. H. Austin
Publ: Traffic Safety v74 n5 p12-4, 36-8 (May 1974)
1974 ; 6p
Availability: See publication

HS-014 620

THE DRIVE TO CUT HOLIDAY DEATHS

Stricter drinking while driving laws adopted in California in 1974 are reviewed. More rigorous prosecution of arrested drivers is forecast, with less plea bargaining by drivers with a blood alcohol content of less than .15%. Lawsuits and public attitudes are cited regarding drinking while driving accidents and injuries, including degree of fault. Increases in drunk driver arrests are also mentioned, along with innovations such as flashing blue and red lights on police cars. Policies under the new law are examined, such as imprisonment, fines, and a driver improvement program for offenders. Greater awareness and participation on the part of judges in dealing with the offenders is emphasized as a goal of the legislation. The role of the Fatal Accident Reduction Enforcement program is also noted.

by W. L. Roper
Publ: California Highway Patrolman v37 n10 p48-9, 52-3, 56-7, 62-3 (Dec 1973)
1973
Availability: See publication

HS-014 621

USING MEASUREMENT IN AUTOMOTIVE ENGINEERING

Some generalizations are offered on the measurements likely to be considered in typical automotive engineering problems and which can be used as guidelines in reducing measurement problems to instrumentation questions. Measurements are described which pertain to emissions, safety (strength testing, structural considerations, crash testing); performance (aerodynamics, drive characteristics, vehicle handling, passenger comfort, engine performance, noise, electrical subsystem characteristics); and component evaluation. A guide to standard measurement quantities and units is included, dealing with mechanics, heat, fluids, acoustics, materials, electricity and magnetism, optics and radiation, and chemistry.

Publ: Automotive Engineering v82 n5 p34-45 (May 1974)
1974
Availability: See publication

HS-014 622

SELECTING INSTRUMENTATION FOR AUTOMOTIVE TEST AND MEASUREMENT

The selection of instrumentation for automotive test and measurement is discussed, with focus on the class of device needed to provide the desired data and the elements which will do the job most effectively. Primary considerations include functions, performance, and features. The basic functions include stimulation, sensing, signal conditioning, and output. Specific mention is made of signal generators, vibration exciters or shakers, special-purpose simulators, stroboscopes, sensors and transducers. Various signal conditioners and output devices are described. Further consideration is given to spectrum analyzers, signal correlators, measuring instruments, data acquisition systems, and test equipment which incorporate all stimulus and signalizing functions. Instrument specification is also detailed.

Publ: Automotive Engineering v82 n5 p46-51 (May 1974)
1974
Availability: See publication

HS-014 623

TURBOCHARGING THE PETROL ENGINE

Consideration of turbocharging the petrol engine is discussed in view of rising gasoline costs and the stricter pollution control legislation. The basic aims of turbocharging are set forth: to increase power, increase economy, and reduce exhaust emissions. Difficulties of matching the turbocharger to the engine are examined with alternatives defined. The compression ratio and octane requirement are discussed along with the general arrangement of the turbocharger between the carburetor and the engine, and thermal and mechanical loading factors. Applications of turbocharging by Oldsmobile, Chevrolet, and Ford are described.

by K. Garrett
Publ: Engineering v214 n3 p183-6 (Mar 1974)
1974
Availability: See publication

HS-014 624

EMISSION CONTROL SERIES: PT. 4, VOLKSWAGEN

Actions taken by Volkswagen to keep its air-cooled engines acceptably clean are reviewed. Design and drawings are given for evaporative emission control, air pump, exhaust gas recirculation, thermostatic air cleaner, throttle-holding devices, positive crankcase ventilation, and vacuum choppers.

by P. Weissler
Publ: Motor Service p20-2, 114, 116-7 (Apr 1974)
1974
Availability: See publication

HS-014 625

EMISSION CONTROL: FIRST, THE BASICS, PT. 1

Basic principles and systems involved in emission control are reviewed. Emissions from three sources are examined: crankcase, exhaust, and fuel evaporation. Consideration is also given to heated air intake, the air injection system, transmission and speed-controlled spark, and exhaust gas recirculation. Design drawings are included. The need for proper specifications and procedural literature is emphasized in dealing with anti-pollution device problems.

Publ: Motor Service p24-7 (Jan 1974)
1974
Pt. 2 is HS-014 626; pt. 3 is HS-014 627; pt. 4 is HS-014 624.
Availability: See publication

HS-014 626

EMISSION CONTROL SERIES: PT. 2, AMC

Systems and methods employed by American Motors Corp. to meet the 1974 emission standards and to improve or maintain good driveability are reviewed. Details are given on the air guard (which injects fresh air into the exhaust stream to give hot emissions extra oxygen), cooling combustion (exhaust gas recirculation), the PCV system, transmission controlled spark system to reduce nitrogen oxides, electrical opening of the choke, and heated intake system. Diagrams are included.

by B. Freudenberger
Publ: Motor Service p30-1, 76, 78 (Feb 1974)
1974
Availability: See publication

HS-014 627

EMISSION CONTROL SERIES: PT. 3, CHRYSLER CORPORATION

Chrysler Corporation's Cleaner Air System, the conglomerate of systems that contribute to emission reduction, is described. Most of the changes for 1974 are minor alterations in evaporative control, exhaust gas recirculation, spark advance, and electrical choke assistance. The heated air system is detailed, along with the air injection system and crankcase checkout. Related reductions in hydrocarbons, carbon monoxide, and nitrogen oxides are considered.

by B. Freudenberger
Publ: Motor Service p32-3, 42, 44, 46-7 (Mar 1974)
1974
Availability: See publication

HS-014 628

A COMPUTER BASED MATHEMATICAL METHOD FOR PREDICTING THE BRAKING PERFORMANCE OF TRUCKS AND TRACTOR-TRAILERS. PHASE 1: MOTOR TRUCK BRAKING AND HANDLING PERFORMANCE STUDY

In order to establish a digital computer-based mathematical method for predicting the braking performance of trucks and tractor-trailers, two simulation programs were developed. Each was based on a two-dimensional mathematical model, one representing a two- or three-axle truck, and the other a three-, four-, or five-axle tractor-trailer combination. In each case the user may specify the vehicle geometry, brakes, suspension, tire and tire-road interface characteristics, weight, and payload distribution, and can introduce road roughness into the program. Detailed descriptions of the mathematical models of the

vehicles, suspension systems, tires, brakes, and brake systems are given, and the digital computer programs for braking performance simulation are described. Vehicle parameters and their measurement are given, and dynamic tests on full scale vehicles are reported. With certain minor qualifications, results from the simulation programs agree well with the results from the tests. Further, it was found that the programs developed are easy to use, allow a large number of options to the user, are efficient and cost effective.

by R. W. Murphy; J. E. Bernard; C. B. Winkler
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
Rept. No. UM-HSRI-PF-72-1; PB-212 805 ; 1972 ; 239p 17refs
Sponsored by the Motor Vehicle Manufacturers Assoc., Detroit.
Availability: NTIS $3.00

HS-014 629

MICHIGAN SCHOOL BUS ACCIDENTS. SCHOOL YEAR 1971-1972

Statistics on school bus accidents in Michigan are given, with three types considered: accidents in which school buses were physically involved; those in which other vehicles caused injury to pupils before boarding or after alighting from buses; and accidents directly or indirectly influenced by the stopping of school buses even though the buses were not physically involved. The the statistics emphasize the need for determining the possible causes of school bus accidents, pointing out the need for more legislation and/or greater diligence and training of bus drivers, school administrators, and equipment suppliers to reduce the problems.

Michigan State Police, East Lansing
1972 ; 42p
Availability: Corporate author

HS-014 630

AIR QUALITY MANUAL: VOL. 1. METEOROLOGY AND ITS INFLUENCE ON THE DISPERSION OF POLLUTANTS FROM HIGHWAY LINE SOURCES. INTERIM REPORT

The basics of meteorology and its effect on pollutant concentrations on and within the highway corridor are discussed. Consideration is given to: the general relationship between meteorology and air pollution; the role of meteorology in the transport and dispersion of air pollutants; a method to estimate the surface stability of the atmosphere; meteorological surveys; meteorological factors to be considered in highway route location; a highway line source model for analyzing meterological data; and sources of meteorological data.

by A. J. Ranzieri
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(1)-72-11; PB-219 811; FHWA-RD-72-33 ; 1972 ; 169p 20refs
Rept. for Jun 1971-Apr 1972. Vol. 2-8 are HS-014 631--HS-014 637.
Availability: NTIS

HS-014 631

AIR QUALITY MANUAL: VOL. 2. MOTOR VEHICLE EMISSION FACTORS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY. INTERIM REPORT

The emission factors which are most representative of vehicles using freeways, local roads, and streets are reported. The emission factors take into account the vehicle deterioration factors, model year, annual mileage traveled, and average route speed. The developed emission factors are based on the best data currently available.

by A. J. Ranzieri
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(2)-72-10; PB-219 812; FHWA-RD-72-34 ; 1972 ; 68p 6refs
Rept. for Jun 1971-Apr 1972. Vol. 1 is HS-014 630; vols. 3-8 are HS-014 632--HS-014 637.
Availability: NTIS

HS-014 632

AIR QUALITY MANUAL: VOL. 3. TRAFFIC INFORMATION REQUIREMENTS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY. INTERIM REPORT

The rationale for the method of air quality analysis which includes a consideration of traffic information is explained. The relationship between the traffic parameters and the way in which air quality is affected are also determined. Consideration is given to vehicle operating mode and pollutant emissions, vehicle volumes, traffic network changes, traffic growth factors, time framework for estimates, and minimum traffic estimate requirements.

by E. C. Shirley
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(3)-72-09; PB-219 813; FHWA-RD-72-35 ; 1972 ; 36p 11refs
Rept. for Jun 1971-Apr 1972. Vols. 1-2 are HS-014 630--HS-014 631; vols. 4-8 are HS-014 633--HS-014 637.
Availability: NTIS

HS-014 633

AIR QUALITY MANUAL: VOL. 4. MATHEMATICAL APPROACH TO ESTIMATING HIGHWAY IMPACT ON AIR QUALITY. INTERIM REPORT

A method of predicting pollutant concentrations within an area of study with and without the new highway is explained. The prediction analysis includes both the highway corridor and the mesoscale. The highway corridor is defined as a region extending from the point where the pollutants are generation by traffic (the highway) downwind to the point where ambient pollutant levels are again reached. The mesoscale is defined as the area throughout which traffic volumes on the surface traffic

network are significantly affected by the construction of a new highway.

by A. J. Ranzieri
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(4)-72-08; PB-219 814; FHWA-RD-72.36 ; 1972 ; 71p 22refs
Rept. for Jun 1971-Apr 1927. Vols. 1-3 are HS-014 630--HS-014 632; vols. 5-8 are HS-014 634--HS-014 637. Appendix is HS-014 634.
Availability: NTIS

HS-014 634

AIR QUALITY MANUAL. VOL. 5. APPENDIX TO VOLUME 4. INTERIM REPORT

A series of curves is presented showing the relationship between ground level pollutant concentration ratio and distance from pollutant source. A series of curves giving vertical and horizontal dispersion parameters is also included. The ground level concentration ratio versus distance curves are divided into four groups: at grade sections where the wind is not parallel to the highway alignment; elevated sections and non-parallel winds; cut sections and non-parallel winds; and varied highway sections with parallel winds.

by A. J. Ranzieri
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(4)-72-08-app; PB-219 815; FHWA-RD-72-37 ; 1972 ; 111p
Rept. for Jun 1971-Apr 1972. Vols. 1-4 are HS-014 630--HS-014 633; vols. 6-8 are HS-014 635--HS-014 637.
Availability: NTIS

HS-014 635

AIR QUALITY MANUAL: VOL. 6. ANALYSIS OF AMBIENT AIR QUALITY FOR HIGHWAY PROJECTS. INTERIM REPORT

The interaction between air pollutant sources and meteorological conditions contributing to the ambient air quality of a community is explained. Air pollutant sources within a highway corridor normally include stationary (domestic heaters, industrial installations, and power plants) and mobile (motor vehicle traffic on highways, local roads and streets) sources. Guidelines are presented to: determine the present ambient air quality along a proposed highway corridor from existing air monitoring station data; determine the present ambient air quality by performing an on-site air quality survey; and perform a mesoscale analysis of ambient air quality.

by A. J. Ranzieri
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(5)-72-07; PB-219 816; FHWA-RD-72-38 ; 1972 ; 112p 22refs
Rept. for Jun 1971-Apr 1972. Vols. 1-5 are HS-014 630--HS-014 634; vols. 7-8 are HS-014 636--HS-014 637.
Availability: NTIS

HS-014 636

AIR QUALITY MANUAL: VOL. 7. A METHOD OF ANALYZING AND REPORTING HIGHWAY IMPACT ON AIR QUALITY. INTERIM REPORT

A manual is presented which discusses the legal requirments for environmental studies, the air pollution phenomena, and air pollutants from vehicles. The subject matter set forth in six preceding volumes of the California-developed air quality manual is related. Specific sections deal with component parts of an air quality study, data presentation, written and tabular data summary, visual aids; response to questions for the environmental impact statement, report outline for an air quality study, building an aerometric data bank, out-of-house studies, and the systems approach to air quality studies.

by E. C. Shirley
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR6570825(6)-72-06; PB-219 817; FHWA-RD-72-39 ; 1972 ; 36p 7refs
Rept. for Jun 1971-Apr 1972. Vols. 1-6 are HS-014 630--HS-014 635; vol. 8 is HS-014 637.
Availability: NTIS

HS-014 637

AIR QUALITY MANUAL: VOL. 8. SYNTHESIS OF INFORMATION ON HIGHWAY TRANSPORTATION AND AIR QUALITY. FINAL REPORT

The legal and medical aspects of air quality are presented along with the relationships between a line source (the roadway) and air quality. The role of the highway engineer in air quality is discussed in terms of planning, design, construction, maintenance, and operation. The importance of research on the subject is stressed.

by J. L. Beaton; J. B. Skog
California Div. of Highways, Sacramento
Contract FH-11-7730
Rept. No. CA-HWY-MR-7080-1-72-45; PB-219 818; FHWA-RD-72-40 ; 1972 ; 46p 50refs
Vols. 1-7 are HS-014 630--HS-014 636.
Availability: NTIS

HS-014 638

CRASH TEST DEVICE DEVELOPMENT; REPEATABLE PETE. APPENDIX A. HSRI TEST PROCEDURES. APPENDIX B. SLED TEST SUMMARY DATA. FINAL REPORT

Appendices to a report on the development and performance of a crash test device, Repeatable Pete, are presented. Details of preparation and procedures for cadaver tests to be used as a basis for the humanlike performance of the test device are given. Sled test summary data for head accelerations and chest accelerations at impact speeds of 26.2-30.8 mph, impacting lap and torso belts, preinflated airbag, dash/windshield, and steering wheel are shown. Severity indices are given for each.

by J. H. McElhaney
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
Rept. No. UM-HSRI-BI-73-3-2; PB-225 177 ; 1973 ; 105p
Sponsored by the Motor Vehicle Manufacturers Assoc., Detroit.
Availability: NTIS $7.25

HS-014 639

RECOMMENDED PRACTICE FOR THE TIRE TMPH APPLICATION

The need for off-road tire ton-mile per hour (tmph) ratings is shown, and recommended usages are given. The history of problems related to off-road tires is cited, with emphasis on tire temperature. The use of the tmph tool in the design of new vehicles is important to make sure that the tire's structural limits are not exceeded. The use of job tmph requirements in the field as a basis for tire selection will make certain that downtime due to tire heat problems will be minimal. There are limits in both load and speed for the use of the tmph concept which must be considered as well as the conditions of ambient temperature. SAE recognition of the use of tmph ratings is mentioned; they will publish tire test standards and recommendations.

by R. M. MacFarland
Goodyear Tire and Rubber Co., Akron, Ohio
Rept. No. SAE-730855 ; 1973 ; 5p
Presented at the National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, 10-13 Sep 1973.
Availability: SAE

HS-014 640

AN OPTICAL OBJECT DETECTION SYSTEM FOR SENSING OBSTRUCTIONS TO LOW SPEED VEHICLES

An object detection system to sense obstructions in the path of low speed vehicles is described. The system uses a pulsed gallium arsenide diode laser as an illuminator, and a PIN photodiode as a detector. Reliable detection of objects with an effective area as small as 0.5 square feet was achieved. A signal processor using active filters and a phase-locked loop tone decoder was employed for both phase and frequency rejection of undesired signals, and detection of objects under high ambient light conditions.

by G. A. Burman
Naval Postgraduate School, Monterey, Calif.
Rept. No. AD-751 639 ; 1972 ; 54p 8refs
Master's thesis.
Availability: NTIS

HS-014 641

DIRTY HEADLIGHTS--FREQUENCY AND VISIBILITY EFFECTS

Three experiments studied the existence and size of the problem of dirt on headlamps. In the first experiment, dirt layers were systematically collected under various road conditions, and the wetness of the road was found to be important. The second experiment measured the light reduction caused by dirt on cars in traffic. It was found that even in dry weather on seemingly clean roads light reduction is normally 10-20%. In bad road conditions, few cars have light reduction below 50%. Drivers usually do not react to light reduction below 60%. In the third experiment visibility reduction in night driving was measured as a function of light reduction. A 60% light reduction causes a 20% reduction of high beam visibility and a 15% reduction of low beam visibility. Headlamp cleaners operating through windshield wipers seem to offer the only solution to the problem.

by K. Rumar
Uppsala Univ. (Sweden). Traf. Safety Res. Group
Rept. No. 136 ; 1973 ; 16p 3refs
Sponsored by a grant from the Fylgias Attioarsfond by Trygg-Hansa Insurance Co.
Availability: Traffic Safety Research Group, Department of Psychology, University of Uppsala, S:t Larsgatan 2, S-752 20, Uppsala, Sweden

HS-014 642

HIGH BEAM INTENSITY AND OBSTACLE VISIBILITY

Visibility distances to obstacles on the right-hand side of a straight two-lane road are determined and show that the range of high beam intensities on the road should be minimized to make the visibility distance in car meetings as long as possible. Results show that: in high beam with opposing high beam of about the same intensity there are no significant differences in the visibility distances as a function of high beam intensity over about 50,000 cd; in high beam with opposing high beam of about three times as large intensity or more there is a large loss in visibility distance; the optimal distance between two approaching vehicles for switching from high to low beam is increased by about 250 m when high beam of one of the two oncoming vehicles is increased from identical intensity to twice the intensity of the first vehicle; in high beam without opposing glare there is very little gain in visibility in relation to the amount of increase of intensity above 50,000 cd.

by G. Helmers; K. Rumar
Uppsala Univ. (Sweden). Traf. Safety Res. Group
Rept. No. 150 ; 1974 ; 35p 13refs
Sponsored by the Swedish Transport Res. Delegation.
Availability: Department of Psychology, University of Uppsala, S:t Larsgatan 2, S-752 20 Uppsala, Sweden

HS-014 643

OBSTACLE VISIBILITY WITH EUROPEAN HALOGEN H4 AND AMERICAN SEALED BEAM HEADLIGHTS

In a series of experiments, night driving visibility distances are measured for European halogen headlights (EH4) and American sealed beam headlights (ASB) in various traffic situations. The results show that the more intense European high beam gives a 15% longer visibility distance to a gray object (0.4 m x 1.0 m) on straight roads, while in sharp curves the difference is negligible. Varied findings are reported for low beam opposing low beam in giving a difference in light distribution. A special glare evaluation carried out by pedestrians and opposing drivers shows higher perceived glare for ASB, but no indication of real discomfort or irritation was obtained. It is demonstrated that low beam vehicle lighting visibility is far from acceptable in relation to normal speeds in night time driving. Polarized headlights offer a long-range solution.

by K. Rumar; G. Helmers; M. Thorell
Uppsala Univ. (Sweden). Traf. Safety Res. Group
Rept. No. 133 ; 1973 ; 52p 25refs
Sponsored by the Swedish Road Safety Board
Availability: Traffic Safety Research Group, Department of Psychology, University of Uppsala, S:t Larsgatan 2, S-752 20 Uppsala, Sweden

HS-014 644

AGENDA FOR THE SUBCOMMITTEE ON REGISTRATION

An agenda for discussion of proposed changes in the Uniform Vehicle Code on registration is presented, covering: odometer reading, reflectorized plates, staggered registration, parental consent for registering vehicles owned by minors, restricted registrations, kit or homemade vehicles, and abandoned vehicles. A summary of the status of state laws comparable to each proposed revision is included. The effect of each proposal is stated along with comparative data and reasons for its support.

National Com. on Uniform Traf. Laws and Ordinances, Washington, D.C.
1974 ; 16p refs
Availability: Corporate author

HS-014 645

AGENDA FOR THE SUBCOMMITTEE ON DRIVERS

An agenda for discussion of proposed changes in the Uniform Vehicle Code on drivers is presented. It covers: definition of driver's license; written accident reports; license for driving in non-highway locations; driver education for all new drivers; motorcycle tests; minimum age for school bus drivers; instruction permit renewal; age for motorcycle instruction permit; proof of age; verification of application; emancipated minor; new resident with valid out-state license; license forms; renewal of expired license; discretionary renewal exams; optometrists as vision specialists; conviction; mandatory revocations; treatment for persons refusing a chemical test; right to refuse a chemical test; implied consent warnings; hearings before license withdrawals; point system suspensions; suspension for incompetency; revocation following a hearing; effect of appeal; mandatory reexamination; habitual offenders; driving with suspended or revoked license; and hours of service. A summary of the status of comparable state laws is included.

National Com. on Uniform Traf. Laws and Ordinances, Washington, D.C.
1974 ; 55p refs
Availability: Corporate author

HS-014 646

INVESTIGATION OF SWITCHING MODES FOR A THREE-BEAM HEADLAMP SYSTEM

Information on the development of three-beam headlamp switching methods is derived. The conditions in which drivers used each of the beams while driving a car equipped with a three-beam headlamp system, and the sequences of switching between the beams, were measured. Questionnaires were also used to provide information of differences between two- and three-beam usage, and ratings of glare and visibility. A set of statements of human factors control-display design principles were compiled to devise a rating scale for the preliminary evaluation of switching concepts. It is concluded that drivers consider the mid beam to offer a worthwhile increase in visibility, compared to the low beam, and would use it in many night driving conditions.

by R. G. Mortimer; D. V. Post
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
Contract UM-7204-C128
Rept. No. UM-HSRI-HF-73-16; PB-224 468 ; 1973 ; 64p 7refs
Sponsored by the Motor Vehicle Manufacturers Assoc., Detroit.
Availability: NTIS $5.25

HS-014 647

INVESTIGATION OF SOME FACTORS AFFECTING THE AIM OF HEADLAMPS

Factors contributing to misaim of headlamps are reviewed along with a series of studies to evaluate the role of some of the factors. These include headlamp aiming methods and devices; the quality of aiming by service stations, repair shops, and dealer service departments; the effect of vehicle service on aim; and the effect of vehicle loading. It was concluded that improved training of service personnel in the use and maintenance of aimers is needed. Mechanical aimers offer greater reliability than other types. Ways need to be found to reduce the errors in locating the vehicle's long axis before other methods can be recommended. Since factory aim is generally better than in the service trade, it is suggested that new car aim should be checked out but not disturbed unless a large error is found.

by P. L. Olson; R. G. Mortimer
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
Contract UM-7204-C128
Rept. No. UM-HSRI-HF-73-13; PB-224 064 ; 1973 ; 67p 10refs
Sponsored by the Motor Vehicle Manufacturers Assoc., Detroit.
Availability: NTIS $5.50

HS-014 648

STATEMENT BEFORE THE SENATE COMMITTEE ON COMMERCE, OVERSIGHT HEARINGS ON THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966, MARCH 28, 1974

Results of low-speed crash test series for 1974 model-year imported automobiles are presented. There are indications that somewhat less damage-prone designs have been adopted by some foreign-car manufacturers, but it is also found that much needless, costly damage still is being designed into, in particular, the corners and sides of the tested models. Examples are cited of various types of impacts: front-into-barrier, rear-into-barrier, front-to-rear intervehicular, front-to-side, and corner tests at 5-15 mph. A complete documentation of the damage susceptibility of the tested 1974 models is included along with similar data for corresponding cars in 1970-1973 models. Attachments give a statement before the House Committee on Interstate and Foreign Commerce, low speed crash test results for domestic automobiles, precrash defects, and correspondence relating to the test program.

by W. Haddon, Jr.
Insurance Inst. for Highway Safety, Washington, D.C.
1974 ; 101p refs
Availability: Corporate author

HS-014 649

NEW 2.3L FORD OHC ENGINE FOR 1974

A new 4-cylinder 2.3L OHC engine developed for 1974 Ford Pinto and Mustang vehicles is described. The engine has several original features, including a die cast aluminum intake manifold and a unique automated method of setting ignition timing. Highlights of the development program include the intake manifold and the lubrication system. Several durability problems were uncovered during the program, and details of the causes and solutions are described.

by E. A. Hardy; J. W. Fostey; R. A. Sbroglia
Ford Motor Co., Dearborn, Mich.
Rept. No. SAE-740030 ; 1974 ; 20p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 650

ALFA-SUD FLAT FOUR ENGINE

The Alfa-Sud engine is a 4-cylinder, liquid-cooled boxer-type layout with a single overhead camshaft for each bank. Some of the design approaches used in meeting the criteria of a high-performance, small-displacement engine for a subcompact sports sedan are discussed. Bulk reduction during the design stage is outlined, along with results of crankshaft load studies. Serviceability was one of the criteria affecting the design, and is shown by the valve adjustment system. Appendices contain crankshaft load data and illustrations describing design, assembly, and service features.

by D. Chirico; C. Bossaglia
Alfa Romeo S.p.A., Milan (Italy)
Rept. No. SAE-740031 ; 1974 ; 13p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 651

DIFFERENTIALLY COATED AND OTHER EFFECTIVE, ECONOMICAL GALVANIZED SHEET PRODUCTS

Corrosion of automobile sheet components in the commonly used gauges of 0.020-0.070 inches and possible solutions to the problem are discussed. Precoated sheet is described with particular emphasis on differentially coated and other galvanized steel solutions. Corrosion is predominantly from one side only of a part so that one-side galvanization gives excellent protection, appearance, fabricability, economy, and reduced amounts of zinc in scrap. For unexposed and low visibility parts, an almost-one-side-galvanized steel is developed for exposed panels, extra smooth G-60 is a practical compromise until a practical one-side galvanized steel can be developed. Fabricable zinc rich prepainted materials have been developed but the costs of producing unexposed, structural grades appear to be prohibitive.

by A. C. Preble
National Steel Corp., Pittsburgh, Pa.
Rept. No. SAE-740033 ; 1974 ; 6p 2refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 652

FATIGUE PROPERTIES OF GALVANIZED STEEL AND HOT ROLLED STEEL BEFORE AND AFTER EXPOSURE TO SALT SPRAY

The advantages of using galvanized steel to protect critical structural members from corrosion are outlined. A sample specimen of galvanized steel was unaffected by exposure to 96 h of salt spray before testing. Comparable fatigue strength for 0.095 in thick hot rolled steel of nearly equivalent chemistry was about 28,000 psi; exposed to 96 h of salt spray it dropped to about 25,400 psi.

by E. A. Loria; G. W. Bush
National Steel Corp., Pittsburgh, Pa.
Rept. No. SAE-740034 ; 1974 ; 12p 3refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 653

CORROSION OF HSLA AND MILD STEELS BENEATH VEHICLES

Vehicles subjected to southern Ontario winters were fitted with samples and used to compare corrosion of high-strength low-alloy (HSLA) steels and mild steel. Results indicate that both types of steel undergo uniform corrosion and pitting. The HSLA steels mostly show similar weight loss and were equal to or better than the mild steel from a pitting standpoint. Two of the six HSLA steels tested showed definite susceptibility to crevice corrosion.

by R. J. Neville; S. H. Melbourne
Dominion Foundries and Steel Ltd., East Hamilton, Ont. (Canada)
Rept. No. SAE-740035 ; 1974 ; 9p 8refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 654

CUMMINS K-SERIES ENGINES

New heavy-duty diesel engines of 6-, 8-, 12-, and 16-cycle rated 75 hp/cyl turbocharged and 100 hp/cyl turbocharged and aftercooled are described. Design and development objectives include maximizing engine durability and reliability and use of common parts in all engine models. Fuel consumption, smoke, exhaust gas emissions, and engine noise equal to or better than the best current engines within engine configurations readily adaptable to current automotive and construction equipment are also prime considerations. Initial models of the engine series meet the design and development objectives.

by J. L. Butler; J. H. Garrett; J. L. Hoch
Cummins Engine Co., Inc., Columbus, Ohio
Rept. No. SAE-740036 ; 1974 ; 15p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 655

DETROIT DIESEL ALLISON'S SERIES 92 ENGINES

The philosophy behind and design features of a new family of high-speed 2-stroke cycle diesels of 270-869 hp are discussed, along with some of the mechanical and performance problems encountered during their development, and some of the test methods used and the results obtained. The good power-to-weight ratios and growth potential of these 92 cubic in (1508 cubic cm) per cylinder engines make them strong contenders as highway truck, industrial, earthmover, and marine prime movers.

by D. B. Field; S. J. Hinkle
General Motors Corp., Detroit, Mich.
Rept. No. SAE-740037 ; 1974 ; 23p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 656

CATERPILLAR 3400 SERIES ENGINES

A new family of heavy duty diesel engines, the 3400 Series, developed by Caterpillar Tractor Co. is described. The family includes Inline 6 cylinder, V-8 and V-12 engines covering the 270-750 hp range. Stringent program objectives were established in the areas of durability, reliability, commonality, flexibility and serviceability within defined limits of cost and weight. Design, development, and manufacturing planning were closely coordinated to ensure economical manufacturing with high volume tooling. The design, development, and certain aspects of engine applications are examined.

by E. J. Kirk; D. R. Krull
Caterpillar Tractor Co., Peoria, Ill.
Rept. No. SAE-740038 ; 1974 ; 26p 1ref
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 657

ELASTO-PLASTIC ANALYSIS OF AUTOMOBILE BODY STRUCTURE BY THE FINITE ELEMENT METHOD

An elasto-plastic analysis based on a plastic hinge mechanism with large deformation analysis for the prediction of the collapse load of an automobile body structure is described. An analysis of a body structure subjected to tensile load of the seat belt is presented. Numerical calculations were made on a body structure subjected to tensile load of the seat belt as regulated by Federal Motor Vehicle Safety Standards, and then computer-calculated results compared with test results. The calculated result is in good agreement with the experimental one.

by K. Kirioka; Y. Hotta; H. Saji
Toyo Kogyo Co., Ltd., Hiroshima (Japan)
Rept. No. SAE-740039 ; 1974 ; 10p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 658

MEAN CRUSHING STRENGTH OF CLOSED-HAT SECTION MEMBERS

A method for approximately calculating the amount of energy absorption of closed-hat section members subjected to axial loading is presented. The analytical relation by which the static mean crushing load is computed when a closed-hat section member is quasi-statically crushed was obtained by the method of limit analysis in consideration of a rolling action. Experimental verification indicates that this method of analysis is very effective. In order to examine the amount of energy absorption of a member under dynamic crushing load, dynamic crushing tests were performed on the same members, and the correlation between the static and the dynamic mean crushing loads was determined.

by Y. Ohkubo; T. Akamatsu; K. Shirasawa
Toyo Kogyo Co. Ltd., Hiroshima (Japan)
Rept. No. SAE-740040 ; 1974 ; 11p 11refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 659

EFFECTS OF FLEXIBLE CONNECTIONS ON BODY STRUCTURAL RESPONSE

An analysis method is presented which provides a systems approach to determine the influence of body connection flexibility upon automobile body structural response. A baseline finite element model is created to simulate the in-plane response of the passenger compartment of a production car. Experimentally obtained connection stiffness data for the baseline model are used in the analysis. The influence of the flexibility of the six major body connections on the elastic response of the body structure is evaluated for four representative loading conditions over the full range of connection stiffness. The connection efficiency and the compatibility between connection flexibility and total structural stiffness distribution are discussed from a design viewpoint. The analysis of the baseline model correlates well with results of tests of a production body structure.

by D. C. Chang
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740041 ; 1974 ; 13p 14refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 660

AN INVESTIGATION OF THE NOISE AND OVERPRESSURE GENERATED BY THE SAFETY AIR CUSHION

Air cushion noise and overpressure experimental study results are presented and methods to reduce these effects are investigated. Free-field studies of inflator noise are made in an open anechoic room, and various silencing devices are tested. Studies are also made of the combined inflator noise and overpressure in a closed passenger compartment. Tests are made for different window openings in the compartment. Results are presented for a new experimental air cushion that draws in air from the passenger compartment as it inflates. Some of the

implications of the data with regard to risk critieria for damage to human hearing are discussed.

by R. Hickling
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740042 ; 1974 ; 15p 13refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 661

A SYSTEMS ENGINEERING EVALUATION OF PASSIVE RESTRAINT SYSTEMS FOR CRASH-IMPACT ATTENUATION IN AIR TRANSPORT AIRCRAFT

Advanced crash-impact protective equipment and techniques applied to crew and passenger crash safety in jet transport aircraft are evaluated. Some 32 state-of-the-art concepts are analyzed from a systems engineering viewpoint with respect to several engineering, psychological, and medical disciplines. An event-oriented flow chart of the crash and escape event is prepared. The 17 events occurring during a crash are included, beginning with system installation and concluding with emergency evacuation of a disabled aircraft. Performance with respect to the events on the flow chart are rated in terms of hazards of system use, maintainability, reliability, human factors, and other technological considerations.

by D. H. Robbins; R. G. Snyder
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
Contract F-33657-71-C-1078
Rept. No. SAE-740044 ; 1974 ; 19p 25refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 662

DESCRIPTION OF THE VOLKSWAGEN RESTRAINT AUTOMATIC (VW-RA) USED IN A FLEET TEST PROGRAM

A new passive restraint system is described which consists of an upper torso belt and an energy-absorbing knee bolster. The operation of the system is automatic as it is attached to the door of the vehicle. The comparison with the three-point belt having a vehicle-sensitive locking retractor and airbag system shows that the overall performance of the VW-RA is superior to the other systems. A fleet test of 50 vehicles in the United States will determine consumer acceptability.

by U. Seiffert; K. Oehm; H. Paitula
Volkswagenwerk A.G., Wolfsburg (West Germany)
Rept. No. SAE-740046 ; 1974 ; 13p 5refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 663

THE 1974 TOYOTA BELT INTERLOCK SYSTEM

The development of a reliable and comfortable off-lock type emergency locking retractor is described which incorporates a locking release mechanism that will operate when a predetermined length of seat belt is pulled out. The device is small enough to be embedded in the roof side structure of a vehicle by using narrow webbing (24mm) and an electrical locking retractor which is smaller than the conventional mechanical type. The electromagnetic ELR system, combined with a mercury g sensor, was tested and evaluated for locking time, comfort, and injury criteria, as well as the strength of the narrow webbing.

by A. Wada; F. Sugiura; K. Okamoto
Toyota Motor Co. Ltd., Kariya (Japan)
Rept. No. SAE-740047 ; 1974 ; 9p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 664

INCREASED SEAT BELT USE AS A RESULT OF IMPROVED SEAT BELT SYSTEMS

The possible long-term effect of the lap belt reminder system on 1972 cars of increasing belt-use frequency was examined. Fleet vehicles equipped with specially designed hardware were used to perform the study. Driver lap belt usage was measured with the buzzer and light reminder system disconnected and with it operating. It was found that: about 33% of the individuals who did not use lap belts will become users for the majority of vehicle trips when the reminder system is operative; no significant relationship between lap belt use and miles per vehicle trip, trips per day, and test subject demographics could be determined; after long exposure, about 50% of the individuals will circumvent the reminder system, the majority manipulating the lap belts and the minority disconnecting the electrical system.

by M. R. Appleby; L. J. Bintz
Automobile Club of Southern California, Los Angeles
Rept. No. SAE-740048 ; 1974 ; 7p 12refs
Prepared in cooperation with the National Hwy. Traf. Safety Administration. Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 665

A FLEET OPERATOR'S COMMENTS ON FMVSS 121 BRAKING SYSTEM COMPATIBILITY

The compatibility related problems observed during limited fleet tests and evaluation of FMVSS 121 braking systems are discussed. The problems of particular concern to vehicle operators, especially fleets, are associated with antilock system intermix, old and new vehicle intermix, and control standardization. Test data, observations, and possible solutions are presented with emphasis on the need for more extensive investigation in this area to ensure that the goal of FMVSS 121--increased truck safety--is achieved.

by J. M. Lewis
United Parcel Service, Inc., New York
Rept. No. SAE-740049 ; 1974 ; 11p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 666

A LABORATORY STUDY OF AUTOMATIC TRANSMISSION THRUST WASHER WEAR

The wear and load capacity of automatic transmission thrust washers was investigated in a laboratory study in which flat, steel-backed washers with successive overlays of bronze and lead-tin alloy were rotated against alloyed cast iron surfaces. Test results demonstrated that the thrust washer antiwear quality of a Dexron automatic transmission fluid containing no sperm oil derivative was comparable to that of a sperm oil derivative-containing Dexron fluid, whereas thrust washer load capacity with the nonsperm oil fluid was somewhat higher than that with the sperm oil fluid. Wear was not appreciably affected by additive package concentration or type. Thrust washer load capacity was increased and wear decreased substantially by a reduction in the surface roughness of either the thrust washer or mating cast iron surface.

by R. McClintock
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740050 ; 1974 ; 13p 3refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 667

AUTOMATIC TRANSMISSION FLUIDS--SOME ASPECTS ON FRICTION

Automatic transmission fluids with different additive systems are compared in several bench friction tests and car friction tests. The correlation between tests is discussed. It is shown that: bench friction tests provide a variety of useful information for the evaluation of new lubricant formulations; the relative friction performance of automatic transmission fluids can vary considerably from one bench friction test to another; and bench friction tests do not always agree with car friction tests and, as a result, car test must be used for the evaluation of automatic transmission fluid.

by E. J. Friihauf
Lubrizol Corp., Cleveland, Ohio
Rept. No. SAE-740051 ; 1974 ; 14p 16refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 668

WET CLUTCH LINING-LUBRICANT ADDITIVE INTERACTIONS

Lubricant and lubricant additive interactions with clutch linings and lining materials were measured at elevated temperatures. Swelling, weight, and compressibility changes were related to material chemistry and endurance test results. Interactions of specific clutch lining ingredient-lubricant additive combinations were identified to help explain why different clutch linings perform better in some lubricants than in others.

by R. K. Nibert; C. E. Albertson
Borg-Warner Corp., Des Plaines, Ill. R. C. Ingersoll Res. Center
Rept. No. SAE-740052 ; 1974 ; 9p 8refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 669

DEXRON-2 AUTOMATIC TRANSMISSION FLUID PERFORMANCE

Four new tests for determining fluid performance and durability of the Dexron-2 automatic transmission fluid specification are described. Results from the tests with Dexron-2 prototype fluids are compared to those with Dexron fluids. It was found that the prototype fluids are much more oxidation-resistant than typical fluids in the Turbo Hydra-matic oxidation test; a 60% improvement in fluid durability in the Turbo Hydra-matic transmission cycling test is realized; and Dexron-2 prototype fluid friction and wear characteristics are about equivalent to those for Dexron fluids in the high energy, friction characteristics and durability test, and the wear test. Fluid deterioration in the transmission tests was determined. Tests were repeatable and results correlated with those obtained in service. Applications of Dexron-2-quality fluids in hydraulic equipment and gas turbine and rotary engines are reviewed.

by M. L. Haviland; R. L. Anderson; E. D. Davison; M. C. Goodwin; R. E. Osborne
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740053 ; 1974 ; 16p 22refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 670

TRANSMISSION AIR BREATHING SUPPRESSOR (TABS) VALVE--A DEVICE FOR IMPROVING AUTOMATIC TRANSMISSION FLUID LIFE

To reduce automatic fluid oxidation and thereby improve fluid and transmission durability, a one-way check valve, called the Transmission Air Breathing Suppressor (TABS), was designed to restrict the intake of air into the transmission and to replace the conventional vent tube. The effectiveness of the TABS valve in reducing fluid oxidation was determined in high temperature transmission cycling tests and in taxicab tests. Fluid oxidation results with the TABS valve-equipped transmissions were compared to those with normally-vented transmissions. By reducing the amount of oxygen in the transmission gas, the TABS valve nearly eliminated fluid oxidation. With such improvement, fluid change intervals may be extended or eliminated.

by E. D. Davison; M. L. Haviland
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740055 ; 1974 ; 12p 12refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 671

STEEL CABLE BUMPER DECELERATOR

A new concept in bumper energy absorption is presented in which the longitudinal impact energy is absorbed transverse to the vehicle. A disc brake actuated by steel cables under tension dissipates the energy as frictional heat. The adaptability

of the system to various deceleration rates and/or vehicle weights is presented along with test results.

by W. J. Riffe
United States Steel Corp., Pittsburgh, Pa.
Rept. No. SAE-740056 ; 1974 ; 8p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 672

THE GENERAL MOTORS HYDRAULIC-PNEUMATIC ENERGY ABSORBER APPLIED TO 1974 BUMPER SYSTEMS

The technical procedure used to establish energy absorber rebound performance characteristics and the modifications made to the General Motors hydraulic-pneumatic design to obtain rebound control on certain 1974 car models is presented. Tests on rear bumpers were also conducted and load values on the hitch ball and energy absorbers for various trailer weights, road conditions, and speeds are given.

by L. L. Kerr
General Motors Corp., Anderson, Ind.
Rept. No. SAE-740061 ; 1974 ; 11p 2refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 673

LINEAR IMPACT SLED FOR AUTOMOTIVE BUMPER TESTING

A linear impact sled set up to develop energy-absorbing bumpers made of urethane foam is described. The design, development, instrumentation, and use, including advantages and disadvantages, are discussed. The equipment used to impact under high- and low-temperature extremes is also discussed. The sled's safety is due to numerous built-in interlocks. The equipment can test foam samples, bumpers, or vehicles. Vehicle masses to 5000-lb and velocities to 10 mph are within the machine's capability. The methods developed for testing bumpers separate from the vehicle have achieved excellent correlation with testing done on vehicles.

by P. A. Weller; J. V. Scrivo
Davidson Rubber Co.
Rept. No. SAE-740063 ; 1974 ; 16p 8refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 674

DESIGN AND DAMAGEABILITY: PERSUASION OR REGULATION?

The capability of designers to produce damage resistant bumpers is discussed. It is shown that if design changes are not made in the areas of truck underride, panic brake dip and dive, and the multipurpose vehicle bumper interface, the automotive industry faces further federal regulation. Crash tests and real-world experience indicates that improved bumpers are cost-effective and can bring about better loss control. There is a gap that must be eliminated between current car designs and their future repair costs. Professional societies and designers can provide the answer through self-policed future designs that recognize both the initial sales appeal of cars and the latent consumer cost of repair when operating automobiles. The alternative could be even more stringent federal regulations.

by J. E. Martens
Allstate Insurance Co.
Rept. No. SAE-740064 ; 1974 ; 9p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 675

PATTERNS OF AUTOMOBILE CRASH DAMAGE

An analysis of 15,000 repair estimates written nationwide on 1973 model passenger cars shows the distribution of impact points around the car, distribution of repair cost, repair and replacement frequencies of certain components, and an analysis of repair cost spending by component assembly. A procedure is described which will monitor the crash damage sustained by new cars through the systematic collection and analysis of insurance company damage repair estimates. Performance comparisons of various model year vehicles will then be possible. The availability and limitations of other insurance industry data sources are also discussed.

by W. W. Sorenson; R. E. Gardner; J. Casassa, 2nd
State Farm Mutual Automobile Insurance Co., Bloomington, Ill.
Rept. No. SAE-740065 ; 1974 ; 23p 7refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 676

TIRE ROUGHNESS--WHICH TIRE NONUNIFORMITIES ARE RESPONSIBLE

A technique developed to determine which tire nonuniformities are responsible for tire roughness is described. The measurement and interpretation of high-speed uniformity and instrumented vehicle data is discussed. The results presented emphasize the necessity of viewing the tire and the vehicle as a dynamically coupled system rather than as two separate and distinct components.

by K. D. Marshall; T. R. Wik; R. F. Miller; R. W. Iden
Goodrich (B. F.) Tire Co., Akron, Ohio
Rept. No. SAE-740066 ; 1974 ; 9p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 677

THE EFFECT OF TIRE CONSTRUCTION ON FUEL ECONOMY

A vehicle test procedure for determining the effect of bias, belted-bias, and radial tires of different designs on constant speed fuel economy was devised. Test results were analyzed on a statistical basis. Results at a 95% confidence level indicate that the use of steel belted radial tires decreases the

fuel consumption approximately 6% when compared to bias and beltedibias tires.

by W. Bezbatchenko
General Tire and Rubber Co., Akron, Ohio
Rept. No. SAE-740067 ; 1974 ; 7p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 678

MATHEMATICAL MODEL TO SIMULATE SAFE HANDLING OF AUTOMOBILE-TIRE COMBINATIONS AND DRIVER'S SKILL INTERACTIONS

A driver's mathematical model developed to find a satisfactory simulation of man's sensitivity and reaction to road stimuli is described. A merely theoretical approach to study the interaction between driver behavior and car response becomes possible, since a 14 degree of freedom car model is available, which reproduces car handling on both smooth and bumpy roads. Any car maneuver can be simulated, irrespective of its hazardousness and no longer neglecting man's behavior. A mathematical approach to safety problems is possible and advantageous since it does not require a test driver to simulate the average man's behavior at the limit condition.

by L. Rinonapoli; R. Bergomi
Pirelli S. P. A., Milan (Italy)
Rept. No. SAE-740069 ; 1974 ; 17p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 679

A REPORT ON THE ROAD ACCIDENT RESEARCH PROJECT TO THE SCIENCE RESEARCH COUNCIL. TRANSPORT SAFETY. VOL. 1

Research results are presented for separate studies on some of the techniques used in the investigation of road accidents, characteristics of accident, and at-the-scene study follow-up on some of the causal factors which relate to road accident occurrences. Specific topics include: the role of the accident investigator; the nature of the collision; rural traffic accidents; comparisons of car crashes in three countries (Great Britain, Australia, United States); safer cars by 1977; accident-based analysis of road user errors; public lighting and road accidents; and the luminous intensity requirements of vehicle front lights for use in towns.

by J. Kolbuszewski; G. M. Mackay; A. B. Clayton
Birmingham Univ. (England)
Rept. No. Dept-Pub-42 ; 1972 ; 142p refs
Supported by the Science Res. Council. Includes HS-014 680--HS-014 683. Vol. 1 of 3.
Availability: Corporate author

HS-014 680

RURAL TRAFFIC ACCIDENTS

Rural traffic accidents are examined in terms of characteristics of collisions, deaths to occupants in private cars in 1966, and injuries and their origins. Rural collisions are differentiated from urban accidents, and it is noted that rural accidents are more severe due to the speeds at which they occur, averaging 47 mph, and a higher incidence of passenger compartment crushing. Various parts of the car are related to the injuries which they produced. Frequency of door openings is cited. Special problems to the emergency services in rural areas are also discussed.

by G. M. Mackay
Publ: HS-014 679, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v1 pt2 p26-32
1972 ; 5refs
Availability: In HS-014 679

HS-014 681

SAFER CARS BY 1977

The outlook for safety design in cars by 1977 is discussed with emphasis on the vehicle as an injury-causing agent. Worldwide programs to develop an experimental safety vehicle are cited and found to pay little attention to pedestrian protection. Bumper injuries are noted. Active and passive phases of vehicle safety are described, including brakes, steering, handling, tires, instrumentation, air bags, lap belts, and windshield glass. Short- versus long-term prospects of the experimental safety vehicles are discussed.

by M. Mackay
Publ: HS-014 679, A Report On The Road Accident Research Project To The Science Research Council. Transport safety. Birmingham, 1972 v1 pt2 p50-2
1972
Availability: In HS-014 679

HS-014 682

PUBLIC LIGHTING AND ROAD ACCIDENTS

Injury accident data were collected for 60 sites before and after the introduction of public lighting. Significant effective injury accident reductions during hours of darkness were found to be associated with the introduction of public lighting in urban, rural, and trunk road environments. For economic analyses under British and similar conditions, it is suggested that effective injury accident reductions during the hours of darkness of 30%, 35-40%, and 30% be assumed to be associated with the introduction of the public lighting for urban, rural, and trunk road environments respectively.

by P. R. Cornwell; G. M. Mackay
Publ: HS-014 679, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v1 pt 3 p14-23
1972 ; 7refs
Availability: In HS-014 679

HS-014 683

THE LUMINOUS INTENSITY REQUIREMENTS OF VEHICLE FRONT LIGHTS FOR USE IN TOWNS

The intensity of a lamp which will be adequately conspicuous without being too bright is studied. It was found that the intensity requirements were largely independent of observer attributes, the luminance of the road surface and its surrounds

and the number and movement of the vehicles. The results suggest that conspicuity and brightness are different attributes of a light. While both increased with increasing intensity, it was found that for a given intensity, the larger source was the more conspicuous and the smaller was brighter. The optimum lighting solution appears to be a town beam, based on dimming the present dipped headlight, giving a straight ahead intensity of 80cd. If the light is based on a small diameter side light, this value needs to be doubled to give adequate conspicuity.

by A. J. Fisher
Publ: HS-014 679, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v1 pt 3 p24-70
1972 ; 37refs
Availability: In HS-014 679

HS-014 684

A REPORT ON THE ROAD ACCIDENT RESEARCH PROJECT TO THE SCIENCE RESEARCH COUNCIL. TRANSPORT SAFETY VOL. 2

Several aspects of driver behavior were studied and evaluated: the effects of commonly prescribed tranquilizers and small amounts of alcohol on driving performance; stress measurement of police patrol-car drivers on motorways; and the problems of driving under urban motorway conditions, focusing on the merging behavior at interchanges. Methods and study results are detailed in each area.

by J. Kolbuszewski; G. M. Mackay; A. B. Clayton
Birmingham Univ. (England)
Rept. No. Dept-Pub-42 ; 1972 ; 156p refs
Vol. 2 of 3. Includes HS-014 685--HS-014 687.
Availability: Corporate author

HS-014 685

A STUDY OF THE EFFECTS OF CERTAIN TRANQUILIZERS AND SMALL AMOUNTS OF ALCOHOL UPON DRIVING PERFORMANCE

The effects of four commonly prescribed drugs (trifluoperazine, haloperidol, chlordiazepoxide, and amylobarbitone sodium) were examined in subjects tested both sober and with alcohol (55-65 mg.%). Three driving tests were used together with measurement of kinetic visual acuity and an objective and subjective assessment scale. The results of the driving tests were consistent neither between drugs nor between sexes. Objective assessment of the subjects showed significant differences in terms of mood between the drug and placebo condition, but there was little interaction with alcohol. Because of the adverse effects upon test performance, physicians should inform patients of the potential dangers involved, and should warn them against driving, at least during the first few days of taking such psychotropic medication.

by A. B. Clayton; T. A. Betts; G. M. Mackay
Publ: HS-014 684, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v2 pt4 p1-95
1972 ; 65refs
Availability: In HS-014 684

HS-014 686

A PILOT STUDY TO INVESTIGATE THE VALUE OF HEART RATE AS AN INDEX OF THE STRESS IMPOSED UPON POLICE PATROL CAR DRIVERS ON MOTORWAYS

The value of heart rate as a measure of the stress incurred by policy patrol car drivers on motorways was assessed. Certain supplementary measures (Subjective Fatigue Scale, Subjective Stress Scale, and Kinetic Visual Acuity) were also used. Two crews of two police officers each were observed over a period of six eight-hour shifts of patrol duty. The results suggested that periods of high heart rate were associated with a greater incidence of active patrol activities than periods of low heart rate. Two of the three other measures also gave significant results. It was concluded that this technique provides a useful and valid measure of stress.

by A. B. Clayton; T. A. Betts; J. P. Bunting
Publ: HS-014 684, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972, v2 pt4 p109-31
1972 ; 9refs
Availability: In HS-014 684

HS-014 687

NORMAL DRIVING BEHAVIOUR AT MOTORWAY INTERCHANGES

A technique for studying the merging behavior of drivers at motorway interchanges has been developed. Based on the concept of interactions, it is designed to relate behavior to traffic flow, vehicle type, and motorway design. The results of a pilot study have suggested that such relationships can be established. If patterns of interaction behavior can be related, then it may be possible to use this technique to predict future patterns of merging behavior and to assess the effects of proposed ramp design and various motorway management techniques upon them.

by A. B. Clayton; J. R. Jarvis
Publ: HS-014 684, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v2 pt4 p132-48
1972 ; 1ref
Availability: In HS-014 684

HS-014 688

A REPORT ON THE ROAD ACCIDENT RESEARCH PROJECT TO THE SCIENCE RESEARCH COUNCIL. TRANSPORT SAFETY VOL. 3

Aspects of injury prevention are reviewed in separate papers. They deal with: the development of laminated and toughened safety glass; restraint system effectiveness; the development of an independent scale, the Deformation Index, to evaluate collision damage severity; characteristics of accidents involving pedestrians, cyclists, and motorcyclists; and the biomechancis of pedestrian collisions and the vehicle-pedestrian interface.

by J. Kolbuszewski; G. M. Mackay; A. B. Clayton
Birmingham Univ. (England)
Rept. No. Dept-42 ; 1972 ; 139p refs
Vol. 3 of 3. Includes HS-014 688-HS-014 692.
Availability: Corporate author

HS-014 689

INJURIES FROM GLASS IN MOTOR VEHICLES

The development of safety glass in motor vehicles is reviewed, showing how the two types, laminated and toughened, have come into use. The mechanisms of injury when a head strikes each type of glass are discussed, and data are presented from a field study of accidents involving both toughened and High Penetration Resistance laminated glass windscreens. The results show that the laminated glass causes fewer and less severe injuries than toughened glass, and this finding is confirmed in other studies. The question of eye injury is also mentioned.

by G. M. Mackay
Publ: HS-014 688, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v3 pt5 p24-47
1972 ; 13refs
Availability: In HS-014 688

HS-014 690

A VEHICLE DEFORMATION INDEX

The background of the development of an independent scale to evaluate collision damage severity is outlined. The Deformation Index is described and its limitations are discussed. The need for the establishment of a data pool of collision photographs of European vehicles is emphasized and the benefits of standardization and interchangeability of data are described briefly.

Publ: HS-014 688, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v3 pt5 p48-56
1972 ; 7refs
Report of the Committee on the Challenges of Modern Society, N.A.T.O. Accident Investigation Workshop.
Availability: In HS-014 688

HS-014 691

PEDESTRIAN AND CYCLIST ROAD ACCIDENTS

Some of the characteristics of accidents involving pedestrians, cyclists, and motorcyclists are described. The age groups particularly at risk are illustrated and the collision circumstances for each road user are detailed. The relative frequencies of collisions with vehicles of various types are outlined, and injury mechanisms of vehcile-pedestrian collisions are given. In pedestrian accidents the frequency with which the various exterior parts of the car cause injury show the importance of improving lower limb contacts with bumpers. Some general implications concerning the segregation of road users and the importance of improving the environment for pedestrians and cyclists are discussed, and the specific problem of the drinking pedestrian is shown to be of consequence.

by G. M. Mackay
Publ: HS-014 688, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v3 pt6 p44-54
1972 ; 13refs
Based on a paper presented at the Forensic Science Society Annual Symposium, Apr 71, Warwick Univ.
Availability: In HS-014 688

HS-014 692

INJURY TO PEDESTRIANS

The biomechanics of pedestrian collisions is examined, with focus on some epidemiological considerations and on pedestrian injuries and their origins. The influence that vehicle shape and resilience have on pedestrian injury is thought to be considerable and bumper improvement is stressed. The relative influence of vehicle and road surface contacts are discussed and means of mitigating the latter are mentioned. The high pedestrian involvement with taxis and public service vehicles is suggested as an area where vehicle design changes might be initiated. Recommendations for further research in the area of pedestrian injury mitigation are given along with other aspects of vehicle design which have some effect on pedestrian accident involvement such as vehicle lighting and the introduction of non-lock braking.

by G. M. Mackay
Publ: HS-014 688, A Report On The Road Accident Research Project To The Science Research Council. Transport Safety. Birmingham, 1972 v3 pt6 p55-80
1972 ; 39refs
Availability: In HS-014 688

HS-014 693

THE FORD LOWER CONTROL ARM SAFETY DEFECT CASE

A fatigue failure occurring at or near the holes in the lower control arm through which the rivets pass connecting the ball joint flange to the arm, at the end nearest the wheel, is described. Control arm breakage causes the front wheel to displace, resulting in loss of vehicle control. It is suggested that DOT should find a safety-related defect in the 5.5 million Ford vehicles (1965-1970) with thin lower control arms and order a manufacturer defect notification campaign. Previous DOT file conclusions are criticized for not considering such points as failure rate disappearance with thickened arms.

Insurance Inst. for Highway Safety, Washington, D.C.
1974 ; 55p refs
Presented to U.S. Dept. of Transp., 20 March 1974. Re: NHTSA ODI Case No. 212.
Availability: Corporate author

HS-014 694

URBAN AREA SAFETY BELT USE IN AUTOMOBILES WITH STARTER-INTERLOCK BELT SYSTEMS: A PRELIMINARY REPORT

Lap and shoulder belts in combination were in use by 44% of drivers of 1974 interlock equipped cars compared to 8% use in 1973 buzzer-light equipped cars, based on observations in three cities. In spite of the interlock system, however, nearly half (47%) of the drivers in the 1974 vehicles were not using any belts. Belt use in 1974 cars was not related to registration date, or age, sex, and racial appearance of driver. Belt use was significantly higher in 1974 cars produced by General Motors and Chrysler than in 1974 cars produced by Ford and Volkswagen.

by L. S. Robertson
Insurance Inst. for Highway Safety, Washington, D.C.
1974 ; 20p 12refs
Availability: Corporate author

HS-014 695

A RANDOM MEASURE MODEL FOR THE EMISSION OF POLLUTANTS BY VEHICLES ON A HIGHWAY

A random measure model for the emission of pollutants by highway vehicles is presented. A collection of vehicles is related as to position, velocity, and time, and the discharge of pollutants is described in mathematical terms.

by P. A. Jacobs
Stanford Univ., Calif.
Contract N00014-67-A-0112-0031 Grant NSF-GP-31392X
Rept. No. TR-29; AD-758 666 ; 1973 ; 35p 9refs
Part of Doctoral dissertation, Northwestern Univ.
Availability: NTIS

HS-014 696

ALDEHYDE AND REACTIVE ORGANIC EMISSIONS FROM MOTOR VEHICLES. PT. 1--ADVANCED AUTOMOTIVE CONTROL SYSTEMS VEHICLES. FINAL REPORT

Results from experimental work in measurement of aldehyde and reactive organic emissions as well as carbon monoxide and oxides of nitrogen emissions from automobiles equipped with various types of advanced prototype emission control systems including both catalytic and thermal reactor type systems are presented. The emissions are characterized to determine the need for aldehyde and/or reactive organic motor vehicle regulations, and to determine the effect of ambient temperature on the emission characteristics of advanced emission control systems.

Bureau of Mines, Bartlesville, Okla.
Rept. No. APTD-1568a; PB-224 251 ; 1973 ; 91p 14refs
Prepared for Environmental Protection Agency
Availability: NTIS

HS-014 697

STUDY OF LOW EMISSION VEHICLE POWER PLANTS USING GASEOUS WORKING FLUIDS. FINAL REPORT

Low emission vehicle powerplants which use gas as the working fluid are studied with emphasis on evaluation of the thermodynamics and preliminary design of several cycles, including: the external combustion piston engine; the closed and open Brayton Cycle engines; the Ackeret-Keller cycle powerplant; the Stirling cycle engines; the evaluation of Rankine cycle and other closed cycle working fluid hazards. A comparison was made of the various powerplant concepts investigated, in addition to a comparison with other existing more conventional powerplants. The various powerplants were compared with respect to weight, cost, complexity, full and part power efficiency, driveability, and especially emissions.

by H. W. Welsh; J. L. Harp, Jr.; R. A. Yano; T. P. Oatway; C. T. Riley; L. Nawroczynski
Thermo Mechanical Systems Co., Canoga Park, Calif.
Contract EHSH-71-003
Rept. No. SR-20; PB-220 148; APTD-1226 ; 1972 ; 356p 65refs
Availability: NTIS

HS-014 698

TRUCK NOISE CONTROL

The basics of heavy diesel truck exterior noise analysis and reduction are discussed. Subjects addressed are noise and its measurement, truck component noise sources and their contribution to overall noise level, analysis methods, and steps required to reduce noise levels. Data from a truck noise analysis and reduction program are presented to illustrate the application of noise control principles.

by R. L. Staadt
International Harvester Co., Chicago, Ill.
Rept. No. SAE-740001; SAE-SP-386 ; 1974 ; 41p 58refs
Presented at the 20th L. Ray Buckendale Lecture. Includes SAE-TR-J366a, "Exterior Sound Level For Heavy Trucks And Buses".
Availability: SAE

HS-014 699

AN INTRODUCTION TO STRUCTURAL ANALYSIS

Various aspects of structural analysis are examined in separate papers. They include: automotive use of finite element methods; how finite element methods improve the design cycle; illustrations of automotive finite elements models (statics and dynamics); how finite element methods are introduced in large and small organizations; and future developments in structural analysis.

Society of Automotive Engineers; Inc., New York
Rept. No. SAE-SP-387 ; 1974 ; 43p refs
Includes HS-014 700--HS-014 705.
Availability: SAE

HS-014 700

AUTOMOTIVE USE OF FINITE ELEMENT METHODS--INTRODUCTION AND OVERVIEW

Background information on automotive use of finite element methods is presented, with emphasis on the stimulus of advances in the computer industry and general engineering. The wide range of structural applications for finite element methods is described, along with the methods themselves and their applications. Illustrations are included to show the many subtle capabilities possible with the method. Automotive applications include: bumpers, frames, fan centrifugal stresses; suspension control arms, mufflers, wheels, forging, casting, sandwich structures, and body structure.

by G. L. Smith
General Motors Corp., Detroit, Mich.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p1-7
1974
Availability: In HS-014 699

HS-014 701

HOW FINITE ELEMENT METHODS IMPROVE THE DESIGN CYCLE

Features of finite element methods that allow design cycle improvements are examined. One of the most important of these features is that models can be constructed, tested, revised,

and retested faster and at less cost in the computer than in the laboratories. This allows evaluation of more proposals and sensitivity studies than might otherwise be feasible. Another feature is the level of confidence that can be put into the results. An illustration is presented of how finite element methods improve a typical design cycle in the automotive industry.

by R. L. Davis
Chrysler Corp., Detroit, Mich.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p8-10
Rept. No. SAE-740003 ; 1974
Availability: In HS-014 699

HS-014 702

ILLUSTRATIONS OF AUTOMOTIVE FINITE ELEMENT MODELS--STATICS

The use of the finite element method in analyzing automotive components under static loads is illustrated. Examples include frame rear rail analysis, styled wheel stress analysis, and analysis of an experimental vehicle front end. They were chosen to show the basic capabilities and unique features of the finite element method and the general-purpose program, NASTRAN (NASA Structural Analysis). Advantages of the method are: reduction of the time of the design cycle; multiple design alternative evaluations in a short period of time; developmental test elimination, resulting in substantial cost savings; design analysis from a drawing in the early stages of the design cycle.

by C. S. Davis
Ford Motor Co., Dearborn, Mich. Product Planning and Res.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p11-15
Rept. No. SAE-740004 ; 1974 ; 7refs
Availability: In HS-014 699

HS-014 703

ILLUSTRATIONS OF AUTOMOTIVE FINITE ELEMENT MODELS--DYNAMICS

The use of finite element methods for modeling automotive structures for their dynamic characteristics is illustrated. Test data are compared with results of the illustrations. One example, the modeling of a vehicle for its dynamic beaming and torsion characteristics, is discussed in sufficient detail to illustrate the steps and resources required for such an analysis. Data preparation, typical finite element models, outline of the analysis, and the display of the data in a movie form are covered. The emphasis is on the modeling process and test correlation and not on the theoretical aspects. The vehicle used for the illustration is not dressed to a curb weight condition, but does illustrate the modeling process.

by C. F. Vail
General Motors Res. Labs., Warren, Mich.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p16-21
Rept. No. SAE-740005 ; 1974 ; 10refs
Availability: In HS-014 699

HS-014 704

HOW FINITE ELEMENT METHODS ARE INTRODUCED IN LARGE AND SMALL ORGANIZATIONS

A plan for introducing finite element techniques into both large and small organizations where the strategy for implementation will vary according to the size of the organization is examined. Discussion of resources required, including manpower, computer hardware and software, and training, are presented. Guidlines are given for setting budgets, integrating the approach into the product design process, reviewing the state-of-the-art, and planning for continued growth in the area.

by E. J. Carl; W. C. Hamann
Structural Dynamics Res. Corp., Cincinnati, Ohio; Ford Motor Co., Dearborn, Mich.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p22-34
Rept. No. SAE-740006 ; 1974 ; 15refs
Availability: In HS-014 699

HS-014 705

FUTURE DEVELOPMENTS IN STRUCTURAL ANALYSIS

Near- and long-term developments aimed at solving problems in structural analysis are reviewed. The power and generality of the finite element approach to structural analysis is noted, along with problems related to its extension into the automotive industry. Consideration is given to developments in graphics, model construction, element definition, software, failure and fatigue analysis, and other design criteria. New extensions for vibration, buckling, and impact simulation are forecast which will further enhance the value of the technique.

by J. E. Thompson
Chrysler Corp., Detroit, Mich.
Publ: HS-014 699, An Introduction To Structural Analysis, New York, 1974 p35-40
Rept. No. SAE-740008 ; 1974 ; 21refs
Availability: In HS-014 699

HS-014 706

EGR SYSTEMS AND THE ENERGY CRUNCH

The controversy over the exhaust gas recirculation (EGR) technique for controlling nitrogen oxide emissions is discussed. Evidence is offered to show that the control techniques do cause substantial loss of fuel economy, in spite of arguments that the loss is due to the added vehicle weight. The EGR system operation is described, with some emphasis on spark delay. The effects of EGR and related system deactivation on fuel economy are explored along with other measures such as periodic engine tuneups. EGR refinements for the future are outlined.

by R. H. Eshelman
Publ: Automotive Industries v150 n9 p55-7 (1 May 1974) 1974
Availability: See publication

HS-600 673

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 2, NO. 5

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1971 ; 263p
Availability: NTIS

HS-600 778

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 3

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 51 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 218p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc. Summary rept. for Jan-Mar 1971.
Availability: NTIS

HS-600 912

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 4

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 40 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1972 ; 259p
Availability: NTIS

HS-600 928

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 5

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 49 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1972 ; 315p
Availability: NTIS

HS-600 977

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 6

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1972 ; 312p
Availability: NTIS

HS-600 979

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 4

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 221p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-600 980

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 5

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 215p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-600 981

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION, VOL. 1, NO. 6

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 217p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-600 982

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 7

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 227p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-600 983

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 8

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 223p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-600 984

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 9

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 63 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 276p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 033

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 7

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy Traf. Safety Administration, Washington, D.C.
1973 ; 270p
Availability: NTIS

HS-601 084

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 8

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1972 ; 240p
Availability: NTIS

HS-601 135

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 9

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 48 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1972 ; 235p
Availability: NTIS

HS-601 136

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 1, NO. 10

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1972 ; 218p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 187

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 1

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 271p
Availability: NTIS

HS-601 218

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 2, NO. 1

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
Contract FH-11-7098
1973 ; 240p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 244

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 2

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 304p
Availability: NTIS

HS-601 285

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION, VOL. 2, NO. 2

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1973 ; 227p 2refs
Co-sponsored by NHTSA and the Automobile Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 291

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 3

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 308p
Availability: NTIS

HS-601 305

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 2, NO. 3

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 49 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1973 ; 239p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 343

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 4

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision, including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 290p
Availability: NTIS

HS-601 395

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 5

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 344p
Availability: NTIS

HS-601 409

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 2, NO. 4

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1973 ; 272p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 447

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 6

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 49 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 357p
Availability: NTIS

HS-601 459

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 2, NO. 5

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1973 ; 398p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 499

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 7

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 387p
Availability: NTIS

HS-601 551

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 8

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 49 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 279p
Availability: NTIS

HS-601 602

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 9

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 327p
Availability: NTIS

HS-601 632

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 2, NO. 6

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1973 ; 403p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 654

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 4, NO. 10

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 49 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 327p
Availability: NTIS

HS-601 705

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 5, NO. 1

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1974 ; 325p
Availability: NTIS

HS-601 709

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION. VOL. 3, NO. 1

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries; their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
DOT-HS-053-2-277
1974 ; 363p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 762

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 5, NO. 2

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 50 case reports are given.

National Hwy. Traf. Safety Administration, Washington, D.C.
1974 ; 329p
Availability: NTIS

HS-601 763

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION, VOL. 3, NO. 2

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries, their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1974 ; 411p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-601 764

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES. LEVEL 3-A: INJURY CAUSATION, VOL. 3, NO. 3

The tri-level accident investigation concept is explained with emphasis on multidisciplinary in-depth information collected on a small sample of accidents by a team of professionals. The investigations were conducted to determine the specific injuries incurred and identify the specific interior components which caused them. Summaries of 50 injury producing accidents are presented. Each summary consists of six parts: identification (date, time, type) of the accident; a brief description of the environmental surroundings; details of damage to the involved vehicles; details of injuries; their severity and causes for each occupant of the case vehicle; a description of the precrash, crash, and postcrash phases of the collision; and a diagram of the collision sequence.

Calspan Corp., Buffalo, N.Y.
Contract DOT-HS-053-2-277
1974 ; 405p 2refs
Co-sponsored by NHTSA and the Motor Vehicle Manufacturers Assoc., Inc.
Availability: NTIS

HS-801 002

BREAKING STRENGTH OF THE HUMAN SKULL VS. IMPACT SURFACE CURVATURE. FINAL REPORT

The effects of surface shape, hardness and impact location on the heads of human cadavers are investigated. Eighty cadavers are studied for the second year, and results and conclusions are listed. Impact surfaces include flat rigid and resilient, rigid cylindrical 1/8 in. radius up to 1 in. radius, resilient cylindrical 1 in. radius and rigid hemispherical shapes ranging from 3 in. to 8 in. radius. Impact locations include front, side and rear. Various impact conditions are related to type of skull fracture produced and head injury parameters such as velocity, peak force, acceleration, contact pressure and magnitude, and Head Injury Criterion (HIC). Conclusions note causes of more lacerative fracture, resistance of the frontal bone, fractures produced by variously shaped surfaces and impacts. HIC is related to maximum contact pressure. Investigation is recommended into effects of crushable surfaces on skull fracture.

by V. R. Hodgson; L. M. Thomas
Wayne State Univ., Detroit, Mich. School of Medicine
Contract DOT-HS-146-2-230
1973 ; 188p 3refs
Rept. for 20 Dec 71-31 Mar 73. See also HS-800 583.
Availability: NTIS

HS-801 080

FRONTAL AND SIDE IMPACT CRASHWORTHINESS--COMPACT CARS, SUMMARY. FINAL REPORT

Techniques for the improvement of front and side vehicle crashworthiness are examined as applied to the 1973 AMC Hornet. General vehicle configuration was maintained as was production feasibility. Total weight increase for all modifications was 104 lbs. Five baseline, three subsystem, and 15 system vehicle crash tests were conducted. Modified vehicles demonstrated substantial improvement over baseline vehicle performance. Mathematical models for estimating dynamic response characteristics of vehicles involved in a wide variety of crash conditions including flat barrier, oblique barrier, pole- and vehicle-to-vehicle impacts were developed. Computer simulations were conducted and results of simulations compared with crash test results.

by W. J. Wingenbach; R. E. Lagerquest
AMF, Inc., Goleta, Calif. Advanced Systems Lab.
Contract DOT-HS-257-2-461
1974 ; 28p
Rept. for June 1972-Dec 1973.
Availability: NTIS

HS-801 096

ALCOHOL, DRUGS, AND DRIVING. FINAL REPORT

Proceedings of a conference on alcohol, drugs, and driving are presented with focus on several topics: alcohol and/or drug influences on driving related behavior as studied in the laboratory, simulator, and closed-course driving experiments; epidemiologic studies and countermeasure research on alcohol and/or drugs in highway crashes. Keyword topics having highest priorities for both basic and applied research in both alcohol and drugs were classified in three general categories: influences upon neurophysiological activities; influences upon the psychological processes of perception, attention, and cognition; and influences in combination with other conditions of the driver, such as emotion and stress. Highest priorities for epidemiologic studies were given to the interaction between alcohol and drugs, to individual differences in alcohol consumption patterns and driving history, and to incidence and prevalence studies of drug involvement. Alcohol countermeasures included enforcement and rehabilitation.

by M. W. Perrine, ed.
Psychological Res. Foundation of Vermont, Inc., Burlington
Contract DOT-HS-265-2-489
1974 ; 404p refs
Proceedings of an invitational symposium held in Warren, Vt., 13-15 Oct 1972.
Availability: NTIS

HS-801 103

VEHICLE DISABLEMENT STUDY--PILOT PROGRAM. VOL. 3: DATA PROCESSING GUIDE. FINAL REPORT

A total of 7000 vehicles that had experienced on-road failure was studied in the San Francisco Bay area. Questionnaires returned by motorists were coded and keypunched for an automated data file. Computer output was generated in the form of cross-tabulation of component faults by year, make, and model of vehicle. Vehicle make and model year for sample vehicles were correlated with comparable data at the county, state, and national levels. Values ranged from 0 .98 for county and sample to 0 .88 for national and sample comparisons. The high correlation indicated that the sample was representative

of the vehicle population and validated the identification of critical component systems for disablements.

by D. N. Schmidt; W. L. Raley; W. R. Long; L. C. Holter
Traffic Safety Res. Corp., Palo Alto, Calif.
Contract DOT-HS-261-3-771
Rept. No. TSR2102-Vol-3 ; 1974 ; 214p
Rept. for Jul 1973-Jan 1974. Prepared in cooperation with the California Hwy. Patrol. Executive summary is HS-801 101; Technical rept. is HS-801 102; Vol. 4 is HS-801 104.
Availability: NTIS

HS-801 104

VEHICLE DISABLEMENT STUDY--PILOT PROGRAM. VOL. 4: DATA COMPENDIUM. FINAL REPORT

Some 7000 vehicles that had experienced on-road failure were studied, in the San Francisco Bay area, from motorist-returned questionnaires, coded and keypunched for an automated data file. Computer output was generated in the form of cross-tabulation of component faults by year, make, and model of vehicle. Vehicle make and model year for sample vehicles were correlated with comparable data at the county, state, and national levels. Values ranged from 0.98 for county and sample to 0.88 for national and sample comparisons. The high correlation indicated that the sample was representative of the vehicle population and validated the identification of critical component systems for disablements.

by D. N. Schmidt; W. L. Raley; W. R. Long; L. C. Holter
Traffic Safety Res. Corp., Palo Alto, Calif.
Contract DOT-HS-261-3-771
Rept. No. TSR2102-Vol-4 ; 1974 ; 277p
Rept. for Jul 1973-Jan 1974. Executive summary is HS-801 101; Technical rept. is HS-801 102; Vol. 3 is HS-801 103.
Availability: NTIS

HS-801 106

VEHICLE LIGHTING

Documents on vehicle lighting are cited which are in the NHTSA Technical Reference Division and which bear a publication date of 1967 through Feb 1974. Citations and abstracts are those that have previously appeared in the NHTSA publication Highway Safety Literature and are included in its automated file.

National Hwy. Traf. Safety Administration, Washington, D.C.
Rept. No. SB-7 ; 1974 ; 96p
Availability: NHTSA

HS-801 112

EVALUATION OF SELECTIVE TRAFFIC ENFORCEMENT PROGRAMS. FINAL REPORT

Evaluations of the first 18 months of the Selective Traffic Enforcement Programs (STEP) in Sacramento, El Paso, and Chattanooga are presented. Fourteen police enforcement countermeasures were designed to be tested in a quasi-experimental environment, with additional countermeasures developed in the areas of public information, traffic engineering, and court procedures. The police countermeasure proven to be most effective in reducing traffic accidents is Patrol and Cite. The El Paso Task Force used this countermeasure along three major thoroughfares from July through December 1972. While the rest of El Paso experienced an increase of 13.1% in traffic accidents over the previous year, one of the STEP streets had a 16.3% decrease, another had a 38.2% decrease, and a third had no change. Injury and fatal accidents decreased 15.6%. Similar decreases were found in Sacramento.

PRC Public Management Services, Inc., McLean, Va.
Contract DOT-HS-268-2-517
1974 ; 152p 2refs
Rept. for Jan 1972-Jul 1973.
Availability: NTIS

HS-801 123

DEVELOPMENT OF TECHNIQUES TO PREVENT OCCUPANT EJECTION DURING ROLLOVER. VOL. 2. TECHNICAL REPORT (FINAL)

A rollover test facility was designed and developed to conform to specifications of FMVSS 208, Notice 9, and was used to perform several vehicle rollovers, using various types of standard production sedans. Test results indicate that difficulties exist in achieving repeatable vehicle rollover kinematics under successive tests where test control parameters are very similar and in conformance with basic requirements of FMVSS 208. Results obtained appear at variance with results of other organizations conducting similar tests. This net project result prevented quantitative evaluation of occupant ejection potential during rollover, and resulted in project direction toward defining critical test parameters and analyzing kinematics differences for successive tests.

by J. S. McKibben; G. S. Clark; L. E. Carlson
Agbabian Associates, El Segundo, Calif.
Contract DOT-HS-214-2-367
Rept. No. R-7228-3158 ; 1974 ; 342p
Final rept. for May 1972-Oct 1973. Vcl. 1 (Executive summary) is HS-801 122.
Availability: NTIS

HS-801 124

EVALUATION OF THE ANTHROPOMETRIC COMPLIANCE TOOL. FINAL REPORT

The utility of the anthropometric compliance tool as a field test instrument and the reliability of tool measurements were examined, and recommendations are formulated for tool redesign or tool procedure modification. The tool was evaluated in terms of its capability to measure two foot controls and three hand controls. Measures of performance included time to assemble, install, and use the tool, procedural errors, and tool accuracy and reliability in measuring distances to controls with respect to the seating reference point. Important findings were: control reach measurement using the tool is highly reliable within and among subjects and vehicles; there were no significant problems in tool use in field test situations; average time to install and use the tool is about one hour; the tool in its present form does not have the required accuracy to ensure valid measurements of control reach of the tolerance placed in the measurements of one inch or less; the tool itself

and its use can be significantly improved through redesign and procedural modification.

Essex Corp., Alexandria, Va.
Contract DOT-HS-120-3-773
1974 ; 101p
Report for Jun-Dec 1973. Includes Anthropometric Compliance Tool Handbook.
Availability: NTIS

HS-801 133

DYNAMOMETER TEST FOR REPLACEMENT BRAKE LINING STANDARD. INTERIM REPORT

The brake linings or pads with which new vehicles are equipped generally require replacement at about 1/3 of the total vehicle mileage. A Federal standard is under consideration to establish minimum performance requirements for replacement linings and pads. A method of evaluating brake lining performance using a single end inertia brake dynamometer is described.

by J. D. Preston
National Hwy. Traf. Safety Administration, Washington, D.C.
1974 ; 56p 8refs
Rept. for Aug 1971-Oct 1973.
Availability: NTIS

HS-801 136

MOTOR VEHICLE EMISSIONS: A BIBLIOGRAPHY WITH ABSTRACTS

A bibliography with abstracts of vehicle air pollution and exhaust emission control is presented. Documents cited are in the NHTSA Technical Reference Division and generally bear a publication date of 1967 or later. Citations and abstracts are those that have previously appeared in the NHTSA publication Highway Safety Literature.

National Hwy. Traf. Safety Administration, Washington, D.C.
Rept. No. SB-9 ; 1974 ; 249p
Rept. for 1967-Mar 1974.
Availability: NHTSA

HS-801 138

FORMULATION OF A REALISTIC WINDSHIELD AND HEADLIGHT DIRT FILM. FINAL REPORT

A dirt film mixture based on a formulation provided in "Composition and Removal of Automobile Windshield Films," published by the Virginia Highway Research Council, is studied, in an effort to obtain a realistic mixture to be used in FMVSS's as a test condition to qualify headlamp and windshield washers and wipers. A complete windshield cowl section is utilized as a test block employing both dark and light backgrounds to provide good contrast for the subjective criticisms and comments on the dirt film. The test dirt film is applied to both windshield and headlamp and checked for effective wipe patterns. Approximate cost of the test dirt film used is 81 cents for a one-ounce dry mix. Results indicate that a dirt film similar to the VHRC film analysis can be readily produced and is a reasonable facsimile of actual dirt films.

Tracor Jitco, Inc., Rockville, Md.
Contract DOT-HS-256-3-542
1973 ; 92p
Availability: NTIS

HS-801 141

MULTIDISCIPLINARY ACCIDENT INVESTIGATION--VOL. 1. MMF--FINAL REPORT 1972

The final report of the Multidisciplinary Accident Investigation Team of the Maryland Medical-Legal Foundation, Inc. is presented. Methodology, results, conclusions and recommendations are described pertaining to the investigation of 53 vehicular accidents occurring in the Greater Baltimore metropolitan area from January, 1972 to August, 1973. Thirty-three fatal and 20 non-fatal accidents are investigated, involving 25 in-depth and 27 limited scope multidisciplinary investigations. Emphasis is placed upon the human factor aspect of the vehicle accident. Investigations include vehicle and scene examination, autopsy findings on fatal victims, toxicological data and psychosocial evaluations of the "at fault" driver population. Evaluation of and recommendations regarding the current Federal Highway and Motor Vehicle Safety Standards are included.

by R. S. Fisher; I. M. Sopher; W. C. Masemore
Maryland Medical-Legal Foundation, Inc., Baltimore
Contract DOT-HS-198-2-316
Rept. No. MMF-FR-1972 ; 1974 ; 206p refs
Rept. for 1 Jan 72-20 Aug 73.
Availability: NTIS

HS-801 142

MULTIDISCIPLINARY ACCIDENT INVESTIGATION--VOL. 2. MMF--FINAL REPORT 1972

Case summaries of 53 vehicular accidents occurring in the Greater Baltimore metropolitan area from January 1972 to August 1973 are collected. Individual, clinical studies of accidents are included. Collisions are identified, and ambience and highway conditions noted. Vehicles involved and occupant data are described. Federal Motor Vehicle Safety Standards and Federal Highway Safety Program Standards relevant in each accident are cited. Pre-crash, crash, and post-crash collision descriptions are included, and causal factors, conclusions, and recommendations are presented.

by R. S. Fisher; I. M. Sopher; W. C. Masemore
Maryland Medical-Legal Foundation, Inc., Baltimore
Contract DOT-HS-198-2-316
Rept. No. MMF-FR-1972 ; 1974 ; 404p
Rept. for 1 Jan 72-20 Aug 73.
Availability: NTIS

HS-801 144

A HUMAN FACTORS ANALYSIS OF MOST RESPONSIBLE DRIVERS IN FATAL ACCIDENTS, TECHNICAL REPORT

A special study of the alcohol/drug problem associated with the most responsible drivers in fatal collisions occurring in the

Greater Boston area investigates four questions in the human/psychological/alcohol/drug areas with regard to these drivers: differences between most responsible drivers who kill themselves (Type 1), who kill another driver or passenger (Type 2), or who kill pedestrians (Type 3). Type Type 2 drivers were significantly different. They included suicide attempt histories, driving without a license, job loss due to alcohol abuse, smoking marijuana, and other drugs involved in the crash. Significant accident causal factors included unfamiliarity with the accident vehicle and passenger distraction for Type 2 drivers. Age may account for some of the factors. Results are related to the Boston Alcohol Safety Action Project countermeasures program.

by R. S. Sterling-Smith; J. C. Fell
Boston Univ., Mass.; National Hwy. Traf. Safety Administration, Washington, D.C.
1973 ; 14p 12refs
Presented at the 17th Annual Conference, American Assoc. for Automotive Medicine, Oklahoma City, 17 Nov 1973.
Availability: NHTSA

HS-801 149

ALCOHOL AND HIGHWAY SAFETY CURRICULUM WORKSHOPS FOR K-12 KEY PERSONNEL. FINAL REPORT

Ten regional workshops were held for local educational personnel in late 1972 and early 1973. Teams of educators were selected from innovative school districts and oriented to the use of alcohol and traffic safety curriculum materials centered on student concerns. Participants attended from 49 states and Puerto Rico. Materials and concepts were introduced to 14,293 teachers and 1,845 administrators by the 333 respondents to a follow-up instrument. Usage with students, estimated from the follow-up survey is placed at 94,000. A case study review of activity in each of the ten NHTSA regions showed much interest and action except when it was delimited or postponed by unavailability or slow delivery of the curriculum materials.

by V. E. Burgener
Technical Education Res. Centers, Inc., Champaign, Ill.
Contract DOT-HS-100-2-503
1974 ; 207p 1ref
Rept. for 28 Jun 72-31 Jan 74.
Availability: NTIS

HS-801 151

FACTORS INFLUENCING ALCOHOL SAFETY ACTION PROJECT POLICE OFFICER'S DWI ARRESTS. FINAL REPORT

Results are summarized of a study to determine the factors influencing Alcohol Safety Action Project (ASAP) police officers' driving while intoxicated (DWI) arrests and the formulation of approaches to minimize the influence of those factors which might discourage the arrest of persons who appear to be driving under the influence of alcohol and augment those factors which might support a decision to arrest. The study was carried out during a series of 16 visits to selected ASAP sites. Officers and supervisors were interviewed in-depth while performing their duties to determine what factors impacted on their DWI arrest decisions. Verification interviews were also held. The survey was followed by the development of recommendations designed to address the factors identified during the site visits.

Young (Arthur) and Co., Washington, D.C.
Contract DOT-HS-123-3-774
1974 ; 144p
Availability: NTIS

HS-801 157

HIGHWAY SAFETY PROGRAM MANUAL. VOL. 12: HIGHWAY DESIGN, CONSTRUCTION, AND MAINTENANCE

This volume provides guidance to state and local governments on preferred highway safety practices in design, construction, and maintenance. The manual gives the authority and general policy guidelines along with procedures for program development and operations, program evaluation, reports, and local government participation. Appendices are included on safety standards, glossary of definitions, references, representative projects, and resource organizations.

Federal Hwy. Administration, Washington, D.C.
1971 ; 62p 28refs
Vols. 0-11 are HS-820 036--HS-820 047; vol. 13 is HS-801 158; vols. 14-18 are HS-820 048--HS-820 050 and HS-801 119--HS-801 120.
Availability: Corporate author

HS-801 158

HIGHWAY SAFETY PROGRAM MANUAL. VOL. 13: TRAFFIC ENGINEERING SERVICES (TRAFFIC CONTROL DEVICES)

This volume examines preferred highway safety practices in the field of traffic engineering services, or traffic control devices. Program development and operation is reviewed along with program implementation and schedule, evaluation, reports, and local government participation. Appendices include data on safety standards, definitions, representative projects, management guide for a statewide inventory, traffic control device maintenance inspections, guides for traffic sign, pavement marking, and traffic signal inventories, and resource organizations.

Federal Hwy. Administration, Washington, D.C.
1973 ; 79p 17refs
Vols. 0-11 are HS-820 036--HS-820 047; vol. 12 is HS-801 157; vols. 14-18 are HS-820 048--HS-820 050 and HS-801 119--HS-801 120.
Availability: Corporate author

HS-801 169

THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION OPERATIONS SYSTEMS DIRECTORY PROJECT. FINAL REPORT

The Operations Systems Directory project for the National Highway Traffic Safety Administration's Information Data System (IDS) is described, to provide the NHTSA with automated capability for locating and defining data elements, and measuring the accessibility and extent of compatibility of these data elements with other automated data files. Access to data requested from the IDS is provided, analysis of accumulated

HS-820 206

data for recognition of highway safety trends is enabled, effectiveness of safety standards is measured, and needs for standards and countermeasures to correct or eliminate traffic safety hazards are identified. Estimated versus actual costs of the NHTSA Operations Systems Directory are cited.

Genasys Corp., Bethesda, Md.
Contract DOT-HS-137-1-210
1973 ; 26p
Availability: NTIS

HS-820 206

ISOLATION OF FLAWS BY USE OF THERMAL DIFFERENTIALS ON A TIRE UNDER MILD LOADING CONDITIONS. PRELIMINARY

HSL 74-11

MEMORANDUM

An experiment was conducted using a Monsanto Infrared Tire Flaw Detector to confirm the hypothesis that areas in tires having poor adhesion or separations tend to achieve a greater rate of temperature rise under conditions of moderate stress than unflawed areas. Three types of stress were tried: constant tire deflection; alteration of inflation pressure; alteration of wheel speed. Tire-to-wheel force in at least one case gave evidence of greater thermal rise rates than in other areas of the tire believed to be normal.

by S. Bobo
Department of Transp., Cambridge, Mass. Transp. Systems Center
Contract HS203
Rept. No. DOT-TSC-NHTSA-72-1 ; 1972 ; 15p
Availability: Reference copy only

SUBJECT INDEX

PERSONAL AUTHOR INDEX

CONTRACT NUMBER INDEX

CONTRACT DOT-HS-100-2-503
HS-801 149
CONTRACT DOT-HS-146-2-230
HS-801 002
CONTRACT DOT-HS-198-2-316
HS-801 141
HS-801 142
CONTRACT DOT-HS-214-2-367
HS-801 123
CONTRACT DOT-HS-257-2-461
HS-801 080
CONTRACT DOT-HS-261-3-771
HS-801 103
HS-801 104
CONTRACT DOT-HS-265-2-489
HS-801 096
CONTRACT EHSH-71-003
HS-014 697
CONTRACT FH-11-7730
HS-014 630
HS-014 631
HS-014 632
HS-014 633
HS-014 634
HS-014 635
HS-014 636
HS-014 637
CONTRACT F-33615-70-C-1777
HS-014 618
CONTRACT F-33657-71-C-1078
HS-014 661
CONTRACT HS203
HS-820 206

CONTRACT N00014-67-A-0112-0031
HS-014 695
CONTRACT UM-7204-C128
HS-014 646
HS-014 647
CONTRACT DOT-HS-268-2-517 S, INC., MCLEAN, VA.
HS-801 112
CONTRACT FH-11-7098 B., INC., BUFFALO, N.Y.
HS-600 778
HS-600 979
HS-600 980
HS-600 981
HS-600 982
HS-600 983
HS-600 984
HS-601 136
HS-601 218
CONTRACT DOT-HS-053-2-277
HS-601 285
HS-601 305
HS-601 409
HS-601 459
HS-601 632
HS-601 763
HS-601 764
CONTRACT DOT-HS-137-1-210
HS-801 169
CONTRACT DOT-HS-120-3-773
HS-801 124
CONTRACT DOT-HS-256-3-542 , MD.
HS-801 138
CONTRACT DOT-HS-123-3-774 NGTON, D.C.
HS-801 151

REPORT NUMBER INDEX

AD-758 666
HS-014 695
AMRI-TR-71-RR, " AD-754 924
HS-014 618
BR-217 805
HS-014 628
BR-219 811, " FHWA-RD-72-33
HS-014 630
BR-219 812, " FHWA-RD-72-34
HS-014 631
BR-219 813, " FHWA-RD-72-35
HS-014 632
BR-219 814, " FHWA-RD-72-36
HS-014 633
BR-219 815, " FHWA-RD-72-37
HS-014 634
BR-219 816, " FHWA-RD-72-38
HS-014 635
BR-219 817, " FHWA-RD-72-39
HS-014 636
BR-219 818, " FHWA-RD-72-40
HS-014 637
BR-220 149, " APTD-1226
HS-014 697
BR-224 044
HS-014 647
BR-224 251
HS-014 696
BR-224 468
HS-014 646
BR-225 177
HS-014 638
SAE-SP-386
HS-014 698
AD-751 639
HS-014 640
APTD-1568
HS-014 696
CA-HWY-MR-7080-1-72-45
HS-014 637
CA-HWY-MR6570825(1)-72-11
HS-014 630
CA-HWY-MR6570825(2)-72-10
HS-014 631
CA-HWY-MR6570825(3)-72-09
HS-014 632
CA-HWY-MR6570825(4)-72-08
HS-014 633
CA-HWY-MR6570825(4)-72-08-APP
HS-014 634
CA-HWY-MR6570825(5)-72-07
HS-014 635
CA-HWY-MR6570825(6)-72-06
HS-014 636
DEPT-DUR-42
HS-014 679
HS-014 684
DEPT-42
HS-014 688
DOT-TSC-NHTSA-72-1
HS-820 206
FHWA-RD-74-8
HS-014 612
HSRI-71-112
HS-014 618
IHRB-74-3
HS-014 616
MVF-FR-1972
HS-801 141
HS-801 142
P-722R-3158
HS-801 123
SAE-SP-387
HS-014 699
SAE-730838
HS-014 600
SAE-730855
HS-014 639
SAE-740001
HS-014 698
SAE-740003
HS-014 701
HS-014 703
SAE-740006
HS-014 704
SAE-740008
HS-014 705
SAE-740030
HS-014 649
SAE-740031
HS-014 650
SAE-740033
HS-014 651
SAE-740034
HS-014 652
SAE-740035
HS-014 653
SAE-740036
HS-014 654
SAE-740037
HS-014 655
SAE-740038
HS-014 656
SAE-740039
HS-014 657
SAE-740040
HS-014 658
SAE-740041
HS-014 659
SAE-740042
HS-014 660
SAE-740044
HS-014 661
SAE-740046
HS-014 662
SAE-740047
HS-014 663
SAE-740048
HS-014 664
SAE-740049
HS-014 665
SAE-740050
HS-014 666
SAE-740051
HS-014 667
SAE-740052
HS-014 668
SAE-740053
HS-014 669
SAE-740055
HS-014 670
SAE-740056
HS-014 671
SAE-740061
HS-014 672
SAE-740063
HS-014 673
SAE-740064
HS-014 674
SAE-740065
HS-014 675
SAE-740066
HS-014 676
SAE-740067
HS-014 677
SAE-740069
HS-014 678
SR-7
HS-801 106
SR-9
HS-801 136
SR-20
HS-014 697
TR-29
HS-014 695
TSR2102-VOL-3
HS-801 103
TSR2102-VOL-4
HS-801 104
UM-HSRI-BI-73-3-2
HS-014 638
UM-HSPI-HF-73-13
HS-014 647
UM-HSPI-HF-73-16

CONTRACTS AWARDED

NHTSA CONTRACTS AWARDED

DOT–HS–027–3–785

LABORATORY TEST PROCEDURES

General Environments Corp.
6840 Industrial Road
Springfield, Va. 22151

No change

$28,800.00

This modification provides for the testing of eight (8) passenger vehicles in accordance with FMVSS No. 215 dated May 18, 1973 (NHTSA Laboratory Procedures).

DOT–HS–042–3–783

LABORATORY TEST PROCEDURES

Ogden Technology Laboratory, Inc.
1536 East Valencia Drive
Fullerton, Calif. 92631

No change

$19,650.00

This modification provides for the testing of ten (10) passenger vehicles in accordance with FMVSS No. 214 dated May 18, 1973 (NHTSA Laboratory Test Procedures).

DOT–HS–042–3–783

LABORATORY TEST PROCEDURES

Ogden Technology Laboratory, Inc.
1536 East Valencia Drive
Fullerton, Calif. 92631

No change

$21,150.00

This modification provides for the testing of fifteen (15) passenger vehicles in accordance with FMVSS No. 216 dated May 18, 1973 (NHTSA Laboratory Test Procedures).

DOT–HS–042–3–783

LABORATORY TEST PROCEDURES

Ogden Technology Laboratory, Inc.
1536 East Valencia Drive
Fullerton, Calif. 92631

No change

$8,925.00

This modification provides for the testing of five (5) passenger vehicles in accordance with FMVSS No. 216 dated May 18, 1973 (NHTSA Laboratory Test Procedures).

DOT–HS–044–3–784

LABORATORY TEST PROCEDURES

Dynamic Science
Division of Ultrasystems, Inc.
1850 W. Pinnacle Peak Road
Phoenix, Ariz. 05027

No change

$26,460.00

This modification provides for the testing of four (4) passenger vehicles in accordance with FMVSS No's 208, 212, and 301, dated May 18, 1973 (NHTSA Laboratory Test Procedures).

DOT–HS–063–1–081 IA Mod. 6

ADVANCED BELT RESTRAINT SYSTEMS TESTS

Department of the Navy
Naval Air Development Center
Warminster, Pa. 18974

Extended to 31 Dec 74

Increased $29,737.00

NHTSA seat and restraint system for use with dummy and human tests will be installed. Dummy tests will be conducted and refresher runs made for volunteer subjects V4 and V7 at 17.5 mph and 30 mph.

DOT–HS–066–3–782

LABORATORY TEST PROCEDURES

Agbabian Associates
250 No. Nash Street
El Segundo, Calif. 90245

No change

$42,749.00

This modification provides for testing of sixteen (16) passenger vehicles in accordance with FMVSS No. 215, and for testing of fifteen (15) passenger vehicles in accordance with FMVSS No's 208, 212, and 301, all dated May 18, 1973 (NHTSA Laboratory Test Procedures).

DOT–HS–068–3–565

FLAMMABILITY OF INTERIOR MATERIALS

United States Testing Co., Inc.
1415 Park Avenue
Hoboken, Hudson, N. J. 07030

No change

$612.00

Twenty (20) tests on the Flammability of Interior Materials FMVSS No. 302 will be made.

DOT–HS–213–3–695 Mod. 4

APL/JHU HYBRID VEHICLE HANDLING PROGRAM

Department of the Navy
Naval Ordnance Systems Command
Washington, D.C. 20360

Extended through 30 Nov 75

Increased $34,000.00

The modification will provide for computational support of Contract DOT–HS–4–00943.

DOT–HS–364–3–757 Mod. 2

ON-THE-ROAD DRIVING BEHAVIOR AND BREATH ALCOHOL CONCENTRATION

Psychological Research Foundation of Vermont, Inc.
P.O. Box 867
Burlington, Vt. 05401

Extended through 28 Feb 75

$56,549.00

Additional data on driving behavior associated with different levels of Blood Alcohol Content (BAC) that may lead to accidents is to be collected to assure that the original research design is completed. Preliminary analysis of the data will be made to determine if the field activities and sample size are adequate. Appropriate changes in the field procedures and sample selection will be made with the concurrence of the Contract Technical Manager.

DOT–HS–4–00849 Mod. 2

CONTRACT TECHNICAL MANAGEMENT SEMINAR

Sterling Institute
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

Extended to 31 Dec 74

$7,200.00

The modification provides for a sixth and a seventh training seminar to be held for National Highway Traffic Safety (NHTSA) Contract Technical Managers. The course is designed to cover the role and responsibilities of such personnel throughout the procurement process, with emphasis on work statements, contract awards, evaluation criteria, contract development and contract administration.

DOT–HS–4–00905 Mod. 1

TIRE TREADWEAR TEST

South Texas Tires Test Fleet
P.O. Drawer J
Devine, Texas 78238

No change

$6,696.00

The Contractor shall measure tread and make tire rotations after each 800 miles, running an additional 24,000 test miles to increase the total vehicle mileage from 114,600 to 138,600 miles.

DOT–HS–4–00908 Amend. 1

TIRE TESTING FOR UNIFORM QUALITY GRADING SYSTEM

Department of the Air Force
HQ 6940th Air Group (USAFSS)
Goodfellow Air Force Base, Texas 76901

No change

$31,400.00

An additional pavement overlay (80′ x 600′) with striping into ten (10) equal areas adjacent to building 431 is provided for. Twelve (12) rooms within building 431 will be equipped with necessary lighting, electrical, and air services with lexan safety glass in partitions as indicated. Additional electrical and air service will be provided for ten (10) posts located at the pavement overlay areas, and for the perimeter road between avenue C and the skid pad access road paved with hot mix overlay.

DOT–HS–4–00914

PEDESTRIAN AND BICYCLE SAFETY STUDY REPORT WRITING AND ADVISORY PANEL MEETING

Lawrence Johnson & Associates, Inc.
2001 S Street, N.W.
Suite 502
Washington, D.C. 20009

This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (15 USC 637(a)), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration.

To be completed 15 Oct 74

$30,700.00

A three (3) day pedestrian and bicycle safety advisory panel meeting shall be arranged and conducted. The purpose of the panelists attending shall be to evaluate the effectiveness of a listing of candidate pedestrian and bicycle safety programs provided by the National Highway Traffic Safety Administration (NHTSA), and to develop a priority for those programs determined to be most effective.

DOT–HS–4–00938

REVIEW AND ANALYSIS OF ASAP ENFORCEMENT EFFORT

Planning and Human Systems, Inc.
4201 Cathedral Avenue, S.W.
Washington, D.C. 20016

This contract is awarded by the Small Business Administration under the authority of Section 8(a)) of the Small Business Act (15 USC 637(a)), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration.

To be completed one (1) year from date of contract award

$135,619.00

The nature and scope of enforcement activity of 27 different Alcohol Safety Action Projects (ASAP's) will be reviewed and analyzed. All phases of the overall enforcement effort are to be considered for relative effectiveness and efficiency, actual or potential. Comparative evaluations of the testing function for presence of alcohol, and of the recording function of the program will be made among the sites involved.

DOT–HS–4–0939

REVIEW AND SUMMARY OF STATE AND COMMUNITY ALCOHOL COUNTERMEASURES PROGRAMS

Planning and Human Systems, Inc.
4201 Cathedral Avenue, S.W.
Washington, D.C. 20016

This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (15 USC 637(a)), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration.

To be completed by 30 Sept 74

$46,964.00

Highway safety alcohol countermeasure programs being conducted by States and their political subdivisions are to be studied. Data requirement design will be identified and procedures will be set out for collection of data regarding State and community Alcohol Countermeasures Programs compatible with existing Alcohol Safety Action Project (ASAP) evaluation data system and access method. The impact of the National Alcohol Countermeasure Programs on State and local highway safety programs is to be determined and results of the entire study will be combined for use of the highway safety community-at-large in guidance and application as appropriate.

DOT–HS–5–01025

TIRE TREADWEAR TEST-REPRODUCIBILITY

Automotive Research Associates, Inc.
5404–08 Bandera Road
San Antonio, Texas 78238

To be completed five (5) weeks from date of contract award

$55,188.00

The specific objective of this contract is to determine reproducibility of test results achieved under DOT–HS–4–00905 on selected candidate tires and the variability of National Highway Traffic Safety Administration (NHTSA) course monitoring results. It will also determine if commercial tires of different size but the same make give the same results. Three (3) convoys, each composed of five (5) identical vehicles and one compact vehicle, shall be operated on a treadwear course of 400 miles length, spaced 20 minutes apart. 18 vehicles using a total of 72 tires will be run for a total vehicle mileage equal to 144,000. Tires will be inflated, rotated, and measured for tread depth at specified intervals in the testing with resultant data being furnished to NHTSA/SRL personnel on a daily basis. Temperature and humidity will be determined, and wet miles recorded as well as mileage on any tire that fails.

DOT–HS–5–01026

TIRE TREADWEAR TEST-VARIABILITY AND NIGHT TESTING

South Texas Tire Test Fleet, Inc.
P.O. Drawer J
Devine, Texas 78016

To be completed five (5) weeks from date of contract award

$65,923.20

Objectives are to determine the variability of the treadwear course, established under DOT–HS–4–00905, when vehicles test the course in different order, and to determine the effects of night testing. The Contractor shall run 24 vehicles, equipped with 96 new tires, a total of 8000 miles in 400-mile segments. Tires will be inflated, rotated, and measured for tread depth at specified intervals. Temperature and humidity will be determined, and wet miles recorded, together with mileage on any tire which fails during the testing. Resultant data will be furnished to National Highway Traffic Safety Administration (NHTSA) personnel on a daily basis.

DOT–HS–5–01027

CONTROL TIRE MOLD. CONTROL TIRES

The Armstrong Rubber Company
500 Sargent Drive
New Haven, Conn. 06507

To be completed 160 days from date of contract award

$28,450.50

A 6.50–15 mold cavity and tread design for traction and treadwear testing is to be manufactured in accordance with National Highway Traffic Safety Administration (NHTSA) Drawing No. 1004. Tires will be manufactured in accordance with tire construction requirements in Table IV, Docket 25; Notice 7(a) which appeared in *Federal Register*, v.39, n.3, Friday, January 4, 1974. A total of 200 tires will be produced (50 each in sizes 6.50–15, 7.75–14, 8.55–15, and 6.50–13).

☆ U. S GOVERNMENT PRINTING OFFICE : 1974 O - 583-254 (4)

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Office of Administration
WASHINGTON, D.C. 20590
OFFICIAL BUSINESS
Penalty For Private Use, $300

POSTAGE AND FEES PAID
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
517